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EPA Superfund
Record of Decision Amendment:

CAPE FEAR WOOD PRESERVING
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FAYETTEVILLE, NC
03/23/2001

AMENDMENT TO THE
RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY
NORTH CAROLINA

PREPARED BY:
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

DECLARATION FOR THE RECORD OF DECISION AMENDMENT

SITE NAME AND LOCATION

Cape Fear Wood Preserving Site
Fayetteville, Cumberland County, North Carolina

STATEMENT OF BASIS AND PURPOSE

This decision document presents the amended Remedial Action for addressing contaminated groundwater at the Cape Fear Wood Preserving Superfund Site in Fayetteville, North Carolina; chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, the National Contingency Plan. This decision is based on the Administrative Record file for this Site.

The State of North Carolina concurs with the amended remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Amendment to the Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment. Presently, no unacceptable current risks have been identified with the Cape Fear Site; the principle threat pertains to the potential future use of the groundwater beneath and downgradient of the Site as a source of potable water. The threat posed by soils to either public health or the environment was eliminated when approximately 113,000 cubic yards of contaminated soils were thermally treated at the Site between June 1998 and May 1999. The amended remedy addresses the future unacceptable risks posed by the contaminated groundwater at the Site.

DESCRIPTION OF THE SELECTED REMEDY

The amended groundwater remedial alternative will permanently remove and destroy the contaminants in the groundwater through groundwater extraction, on-site treatment, and in-situ biodegradation. The revised groundwater remediation alternative involves the following activities:

- Extract contaminated groundwater through extraction wells and a french drain. The specific treatment process/system for the groundwater will be determined by the subcontractor awarded the contract to build and operate the groundwater remedial action;

- On-site treatment of the extracted groundwater to the degree necessary in order to re-introduce the treated groundwater back into the aquifer to promote in-situ biodegradation of the organic contaminants in the aquifer;

- Addition of nutrients/oxygen to the treated groundwater prior to being discharged into the underlying aquifer within the boundaries of the plume in order to promote and sustain aerobic in-situ biodegradation of the organic contaminants;

- When necessary, the treated groundwater will be discharged to the local sewer system under a discharge permit;

- Introduce atmospheric air (oxygen) into the underlying geology through air sparging wells throughout the entire plume in order to promote and sustain aerobic biodegradation of the organic contaminants; and

- Revise the groundwater performance standards to reflect current North Carolina groundwater standards.

STATUTORY DETERMINATIONS

The amended remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the Remedial Action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment which reduce toxicity, mobility, or volume as a principal element. Because this remedy may result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of the Remedial Action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Richard D. Green
Division Director

23 MAR 01
Date

THE DECISION SUMMARY
FOR THE AMENDMENT
TO THE RECORD OF DECISION

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY
NORTH CAROLINA

PREPARED BY:
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LIST OF ACRONYMS

ARAR	-	Applicable or Relevant and Appropriate
BTEX	-	benzene - toluene - ethylbenzene - xylene
BTX	-	benzene - toluene - xylene
CCA	-	copper - chromium - arsenic
CERCLA	-	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund)
CFR	-	Code of Federal Regulations
DNAPL	-	Dense Non-Aqueous Phase Liquids
EPA	-	Environmental Protection Agency
ESD	-	Explanation of Significant Difference
FS	-	Feasibility Study
HRS	-	Hazardous Ranking System
LDR	-	Land Disposal Restrictions
MCLs	-	Maximum Contaminant Levels
NCDENR	-	North Carolina Department of Environmental and Natural Resources
NCP	-	National Contingency Plan
NPDES	-	National Pollutant Discharge Elimination System
NPL	-	National Priority List
O&M	-	Operation and Maintenance
PAHs	-	Polycyclic Aromatic Hydrocarbons
POTW	-	Publicly Owned Treatment Works
ppm	-	parts per million
PRPs	-	Potentially Responsible Parties
PWC	-	Public Works Commission
RA	-	Remedial Action
RCRA	-	Resource Conservation and Recovery Act
RD	-	Remedial Design
RD/RA	-	Remedial Design/Remedial Action
RI	-	Remedial Investigation
RI/FS	-	Remedial Investigation/Feasibility Study
ROD	-	Record of Decision
SVOCs	-	Semi-volatile Organic Compounds
TBC	-	To Be Considered
TCLP	-	Toxicity Characteristic Leachate Procedure
Fg/kg	-	micrograms per kilogram
Fg/l	-	micrograms per liter
U.S.C.	-	United States Code
VOCs	-	Volatile Organic Compounds

AMENDMENT TO THE RECORD OF DECISION FOR THE CAPE FEAR WOOD PRESERVING SUPERFUND SITE FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

1.0 INTRODUCTION

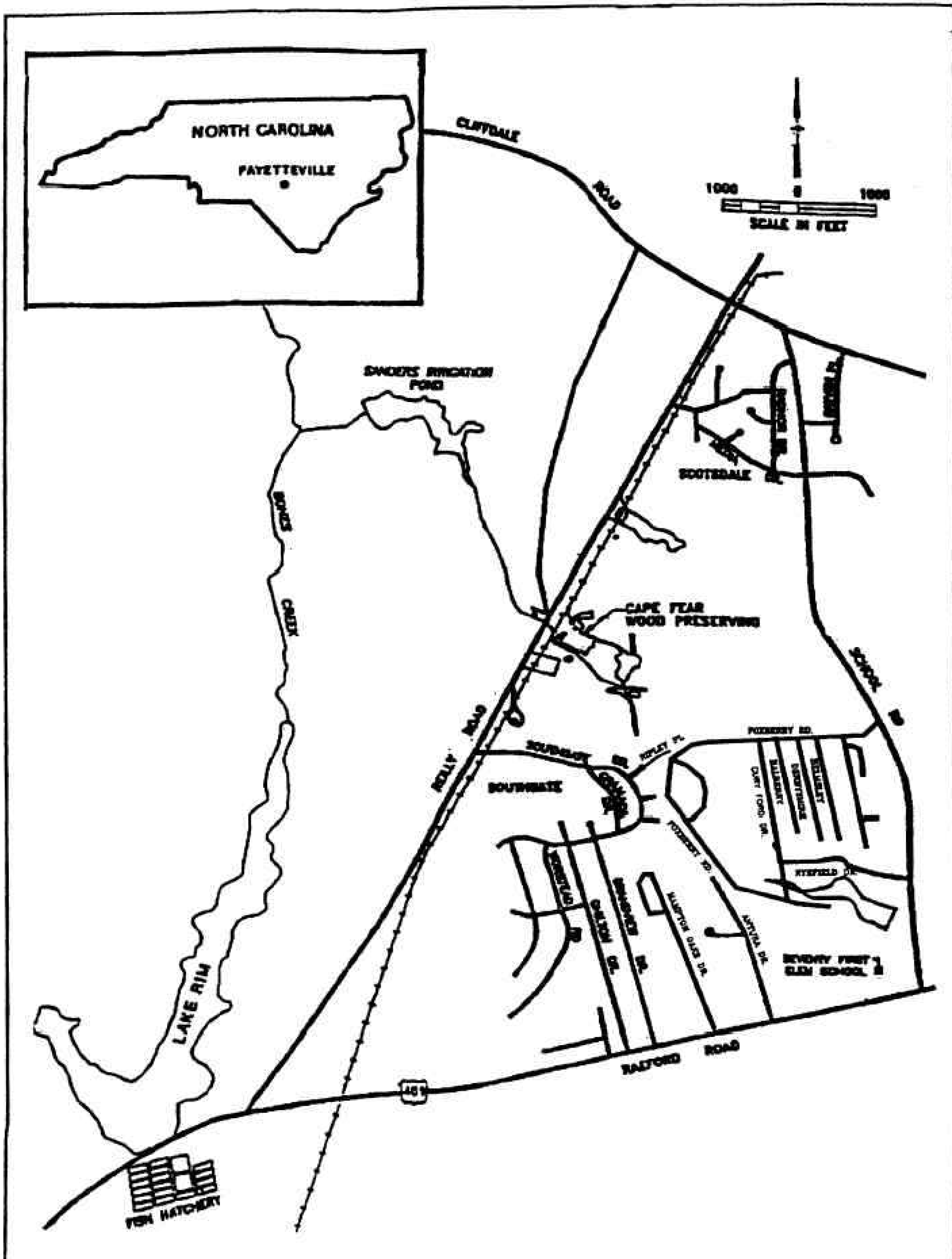
This Amendment to the June 30, 1989, Record of Decision (ROD) accomplishes the following: 1) provides a current status of the Site, including recently completed activities, 2) documents the Agency's decision to discharge treated groundwater via two (2) options [through infiltration galleries and off-site to the local publicly owned treatment works (POTW) or sewer system], 3) specifies the use of air sparging wells to address the benzene plume, 4) incorporates the use of monitored natural attenuation, and 5) updates the groundwater performance standards. This ROD Amendment incorporates the 1989 ROD (Appendix A) by reference and three (3) previous Explanation of Significant Differences (ESDs) (September 24, 1991, August 14, 1995, and May 31, 1996) issued by the Agency. All provisions of the 1989 ROD and the three ESDs issued by the Environmental Protection Agency (EPA) not inconsistent with this ROD Amendment remain in full force and in effect. EPA is the lead agency and the State of North Carolina Department of the Environment and Natural Resource (NCDENR) is the support agency for this Site. The State of North Carolina has concurred with this ROD Amendment.

1.1 SITE LOCATION AND DESCRIPTION

The Cape Fear Site is located in Cumberland County, North Carolina, on the western side of Fayetteville near Highway 401 at 1219 South Reilly Road (**Figure 1**). Of the approximately 41 acres comprising the Site, less than 10 acres were developed by the facility. The terrain of the Cape Fear site is predominantly flat, with drainage provided by a swampy area on the northeast side of the Site and a man-made ditch to the southeast that extends southeastwardly. The upland section of the Site is sandy and well-drained. A variety of land uses exist around the Cape Fear site. The properties to the north include an undisturbed pine forest, a concrete plant, and a few residential properties. To the east is a continuation of the undisturbed pine forest and newly constructed residential properties, and to the west is farmland used for growing crops and raising livestock. To the south is another concrete plant as well as the Southgate subdivision. All structures have been removed from the Site.

1.2 SITE HISTORY

Operations at the Cape Fear Wood Preserving Site commenced in 1953 and continued until 1983. The Cape Fear Wood Preserving facility produced creosote-treated wood from 1953 until 1978 when demand for creosote-treated products declined. Wood was then treated by a wolmanizing process using salts containing sodium dichromate, copper sulfate, and arsenic



SITE LOCATION MAP
CAPE FEAR WOOD PRESERVING SUPERFUND SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE 1

pentoxide. This treatment process is known as the copper-chromium-arsenic (CCA) process. The date the CCA process was initiated is unknown. Nor is it known whether the creosote and CCA processes occurred simultaneously or in succession.

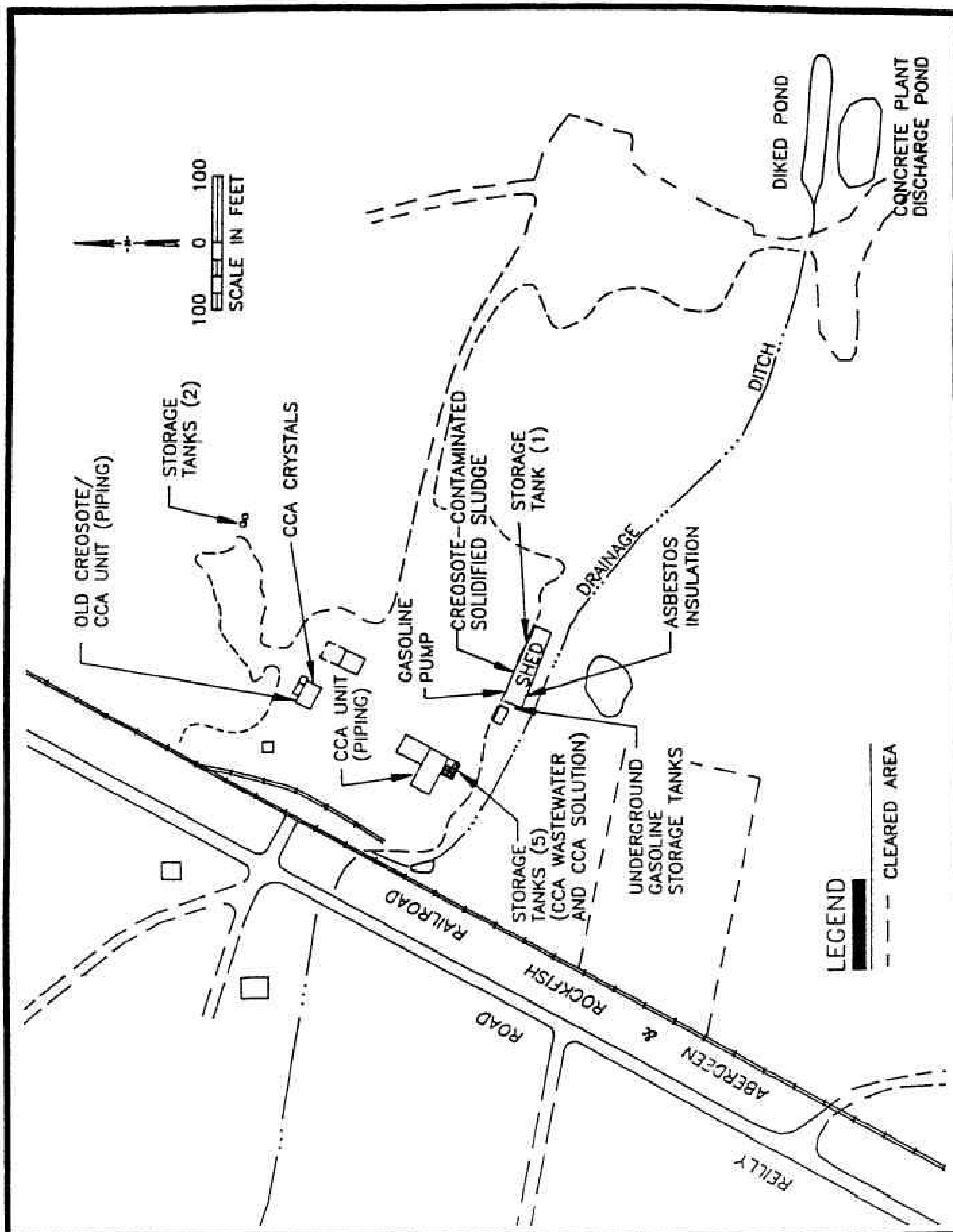
Both liquid and sludge wastes were generated by these two treatment processes. Waste from the creosote process was pumped into a concrete sump north of the treatment unit. As liquid separated from the sludge, it was pumped into a drainage ditch that lies southeasterly of the developed portion of the Site and discharges into a diked pond. Stormwater runoff from the treatment yard also drained into this ditch. Waste from the CCA treatment process was pumped into a unlined lagoon north of the dry kiln and allowed to percolate into the ground. **Figure 2** locates were structures used to stand on the facility.

In the summer of 1977, the Site was determined to be contaminated with constituents of coal tar and coal tar creosote. State authorities ordered the owner/operator to comply with North Carolina law. As a result, the owner/operator changed operations to limit further releases, installed a new potable water well for a neighbor west of the site, and removed 900 cubic yards of creosote-contaminated soil from the treatment yard and the drainage ditch that parallels the railroad. Another term used for creosote compounds is polycyclic aromatic hydrocarbons (PAHs).

Sometime between 1979 and 1980, a new closed-circuit CCA plant was installed and the old creosote and CCA facilities were decommissioned. The new CCA plant was regulated under the Resource Conservation and Recovery Act (RCRA) as a small generator until 1983, when the company went out of business. The Site was subsequently abandoned until the summer of 1988 at which time SECo, Investment, Inc. purchased the property.

EPA conducted a Site reconnaissance and Site investigation in October 1984. Surface water, groundwater, soil and sediment samples were collected from the northeast swamp, an on-site diked pond, unlined lagoon, drainage ditch, and a private potable well west of the site. PAHs and the CCA metals were detected in all samples. Consequently, EPA conducted an emergency removal action at the Site in January and February 1985. This actions included:

- removal of creosote sludge from the creosote concrete sump;
- removal and solidification of sludge from the lagoon to a depth of 7 feet;
- transfer of lagoon water into above-ground storage tanks located south of the CCA unit;
- removal of contaminated soil from the drainage ditch that parallels the railroad tracks and at the culvert near Reilly Road; and
- removal of contaminated soils from a portion of the northeast swamp and stained areas in the treatment yard.



SITE MAP	FIGURE NO.
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	2

All excavated soils and sludges were transported to the GSX hazardous waste landfill in Pinewood, South Carolina.

A Site Investigating occurred between May and October 1985. Soil, sediment, surface water, and groundwater samples were collected. Analytical results again showed that samples were contaminated with PAHs and arsenic, chromium and copper.

EPA conducted a second emergency response in September 1986 when a Site visit revealed that vandals had shot holes in a 3,000-gallon above-ground storage tank spilling approximately 500 gallons of creosote on the ground. The cleanup effort included:

- removal, solidification, and transport of approximately 10 cubic yards of creosote-contaminated sludge to an on-site metal shed east of the CCA unit;

- removal and transport of the creosote storage tank to the on-site metal shed;

- excavation and grading of the area where the creosote tank had leaked;

- pumping of approximately 15,000 gallons of CCA waste water from the CCA recovery sump into on-site above-ground storage tanks located south of the CCA unit; and

- construction of an earthen dike around the CCA recovery sump.

1.3 ENFORCEMENT ANALYSIS

Several Potentially Responsible Parties (PRPs) were identified, including the Cape Fear Wood Preserving Company (no longer active entity), Johnson & Geddes Construction Company (no longer active entity), John R. Johnson, Doretta Ivey (wife of former president of the Cape Fear Wood Preserving Company -- deceased), and Dewey Ivey, Jr. (son of the former president -- deceased). Recently identified PRPs include SECo Investments, Inc. (SECo), Southeastern Concrete Products, Inc. (SE-Lum), Southeastern Concrete Products of Fayetteville, Inc. (SE-Fay), Mr. Steve Floyd, Mr. Louis Lindsey, and Mr. James Musselwhite.

In December 1984, EPA issued notice letters to the PRPs informing them of EPA’s intention to conduct Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial activities at the Site unless the PRPs chose to conduct such actions themselves. The PRPs were sent notice letters rather than an administrative order because of their presumed inability to pay for either the Remedial Investigation/Feasibility Study (RI/FS) or the remedial action. On June 5, 1989, these PRPs were sent Remedial Design/Remedial Action (RD/RA) notice letters informing them that the Agency was planning on spending Fund monies to clean-up the Site.

2.0 CURRENT SITE STATUS

The Site has been abandoned since 1983. Although SECo Investments, Inc. purchased the property in the summer of 1988, SECo has not done anything with the property except to use the portion of the Cape Fear property immediately behind the Southeast Concrete Company facility as a dumping area for unused concrete.

Since the issuance of the ROD in 1989, three (3) ESDs have been issued for the Cape Fear Site. Briefly, the function of an ESD is to relate to all parties of concern that EPA is enacting a significant alteration to a component of a Superfund site Remedial Action (RA). The requirements of an ESD are specified in Section 117(c) of the CERCLA and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The first ESD, issued in September 1991, precipitated from the findings of the two treatability studies conducted as part of the 1989-1990 Remedial Design (RD). This first ESD accomplished the following:

- selected soil washing over low thermal desorption as the primary remedial technology to address soil contamination at the Site;
- acknowledged the potential need to solidify some soil using a cement/ash mixture to address the elevated concentrations of the two metals: arsenic and chromium;
- selected activated carbon adsorption as the primary treatment technology for treating groundwater;
- recognized the potential need for pretreatment of the contaminated water stream to remove suspended solids and oxidized iron prior to activated carbon filtration; and
- selected Bones Creek as the discharge point for the treated water.

During discussions with EPA's RA contractor, it was decided to divide the RA into four phases. Activities involved in each phase are detailed in Sections 2.1, 2.2, and 2.3.

The second ESD, issued in August 1995, was required in order to discharge treated water into the drainage ditch on the southeast side of the Site as activities conducted during Phase I generated small amounts of contaminated water. Since the discharge pipeline would not be installed until Phase III, the contaminated water generated during Phase I was treated and discharged on-site. The water discharged on-site was treated to meet the substantive requirements of a National Pollutant Discharge Elimination System (NPDES) permit. In accordance to Section 300.400(e)(1) of the NCP, an actual permit was not required. Section 300.400(e)(1) of the NCP states, "No federal, state, or local permits are required for on-site response actions conducted pursuant to CERCLA sections 104, 106, 120, 121, or 122."

The third ESD, issued in May 1996, accomplished the following two items:

- the elimination of the biotreatment step from the soil remediation process and

- a change in the point of discharge of the treated water to the local POTW [owned and operated by the Public Works Commission (PWC) of the City of Fayetteville] from the Site from Bones Creek.

2.1 PHASES I AND II

Phase I included the following major tasks: clearing and grubbing the Site; installation of an access control fence around the contaminated portion of the Site; emptying, cleaning, dismantling, transporting, and disposing of nine aboveground tanks and one underground tank and the associated piping; excavating contaminated soil in the area where the railroad by-pass track was to be installed; and transporting and disposing of debris/hazardous waste material, including soils contaminated with CCA crystals, solidified creosote, and asbestos-containing insulation. This work was performed between June and September 1995. Phase II included the following major tasks: construction of a temporary by-pass for an active railroad track, excavating the contaminated soils beneath the railroad track, and returning the railroad track back to its original route. This work was completed in the Spring of 1996.

2.2 PHASE III

Soil remediation phase was subdivided into two (2) phases: Phase IIIA and Phase IIIB. Phase IIIA involved implementing a soil washing technology. Mobilization of equipment to the Site to conduct the soil washing demonstration test began on June 11, 1996. The actual demonstration test was completed on September 23, 1996. Following the submittal of the Soil Washing Demonstration Test Report on October 5, 1996, the Agency concluded that the soil washing process did not achieve the soil performance standards or applicable or relevant and appropriate requirements (ARARs) set forth in the 1989 ROD. Consequently, the Agency initiated low-thermal desorption which was the contingency remedy for soils specified in the 1989 ROD.

A December 1996 fact sheet informed the public that the soil washing demonstration test failed to achieve the soil performance standards specified in the 1989 ROD. Consequently, the Agency abandoned the soil washing technology and implemented the contingent remedy, low-thermal desorption technology to remediate the soils.

The treatment of the soils via low-thermal treatment was designated as Phase IIIB. The low-thermal desorption subcontractor began mobilization to the Site on June 12, 1998. The thermal treatment system typically operated 24 hours/day, 7 days/week with occasional shutdowns for preventative, corrective, and emergency maintenance work. Treatment of contaminated soil began on July 8, 1998 and was completed on May 1, 1999. Approximately 113,000 cubic yards of contaminated soils were excavated, thermally treated, backfilled, graded, and re-vegetated. The final inspection was conducted on June 1, 1999. NCDENR/Land Quality Section accepted the final regrading/re-vegetation/erosion control on September 2, 1999.

Consequently, this ROD Amendment does not involve or discuss either general Site clean-up activities or soil remediation.

2.3 PHASE IV

This ROD Amendment focuses on the remediation of the groundwater. During the soil remediation phase, Phase IIIB, one of the excavations near the middle of the Site was dug to a depth of approximately 20-25 feet. At the bottom of this excavation, an 80-foot long french drain was constructed. **Figure 3** shows the location, orientation, and construction of this french drain.

As a result of installing the french drain, the Agency elected to reassess the 1990 groundwater RD. As part of this reassessment, additional field work was conducted. This work and the findings reached as a result of this work are discussed below. Based of the conclusions of this reassessment, the Agency elected to revise the groundwater RD. The revised groundwater RD was finalized on October 4, 2000.

2.4 HYDROGEOLOGICAL SETTING

The recent field work, conducted as part of the RD's reassessment, did not significantly alter the Agency's understanding of the underlying hydrogeology. Therefore, refer to Section 3.1 of the 1989 ROD and Sections 2.4 and 2.5 of the Final Groundwater Design Report, October 2000, for a complete discussion of the hydrogeology.

2.5 PATHWAYS AND ROUTES OF EXPOSURE/RISK ASSESSMENT

The information generated during the RD has not altered the Agency's opinion with regard to the risk posed by the Site. However, since the soils have been remediated, the soil no longer poses an unacceptable risk. Currently, contaminated groundwater only poses as an unacceptable future risk. Refer to Section 3.7 of the 1989 ROD for a complete discussion on the routes of exposure and risk posed by the Site.

3.0 1989 RECORD OF DECISION

In preparation of writing the 1989 ROD, the 1988 Remedial Investigation (RI) delineated groundwater contamination at the Site. **Figure 4** delineates the benzene (designated as Total BTX) and PAH plumes emanating from the Site. As can be seen, both plumes reflect the radial flow of groundwater leaving the Site.

The following language was lifted from the original groundwater remedy in the 1989 ROD:

> Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Recovery will be conducted in 10,000 square foot subareas at a time, and the well points will be moved to adjacent areas for subsequential dewatering.

Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.

A water treatment system will be established on-site. The system's influent will include contents of the tanks and piping, all wastewater generated due to remedial actions implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a surface stream. The range of treatment for the contaminated water includes biological degradation, air stripping, filtration through activated carbon filter, and metal removal through flocculation, sedimentation and precipitation. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluents, including both discharged water and/or air, will meet all ARAR's.

3.1 1989 RECORD OF DECISION GROUNDWATER REMEDIATION ALTERNATIVES

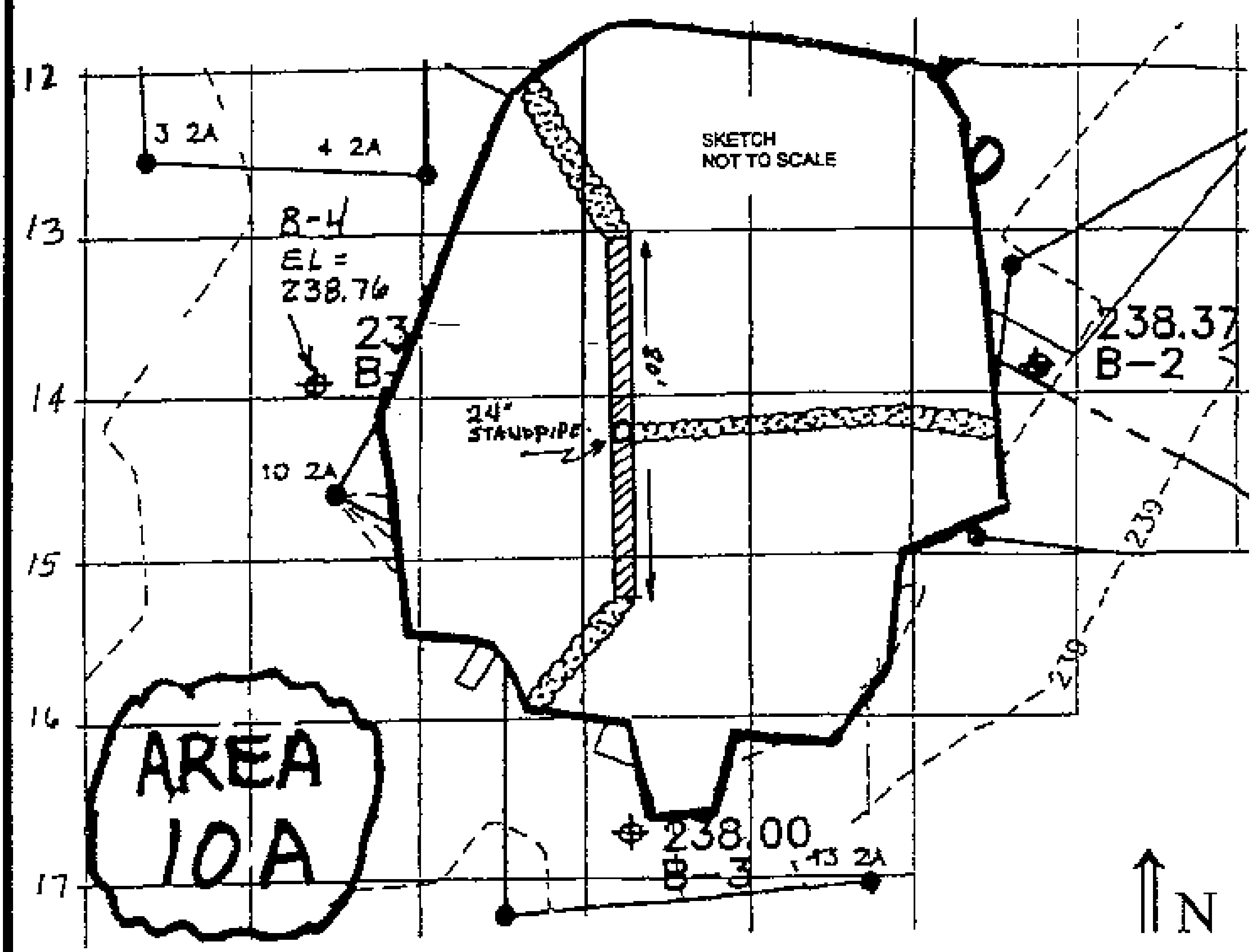
The five groundwater remediation technologies/alternatives considered in the 1989 ROD are summarized below:

- No Action/Long-Term Monitoring;
- Flocculation, Sedimentation, Filtration, Carbon Adsorption, Discharge to surface water;
- Flocculation, Sedimentation, Filtration, Air Stripping, Carbon Adsorption, Discharge to surface water;
- Filtration, Air Stripping, Carbon Adsorption, Discharge to surface water; and
- Flocculation, Sedimentation, Filtration, Discharge to POTW.

Table 1 evaluates and compares the remediation technologies/alternatives listed in the 1989 ROD.

3.2 1998 RECORD OF DECISION PERFORMANCE STANDARDS

The groundwater performance standards specified in the 1989 ROD are specified in **Table 2**.



STANDPIPE: The standpipe was constructed of 24-inch diameter schedule 40 steel pipe. The 10-foot bottom section was provided with ¼-inch holes over the entire surface. The bottom was solid steel plate without holes. Upon installation, the standpipe was modified to limit the bottom section to six-feet. This was accomplished by applying two layers of heavy polyethylene liner over the upper four-feet of holes. The two layers were secured by strapping the liner around the pipe with stainless steel bands.

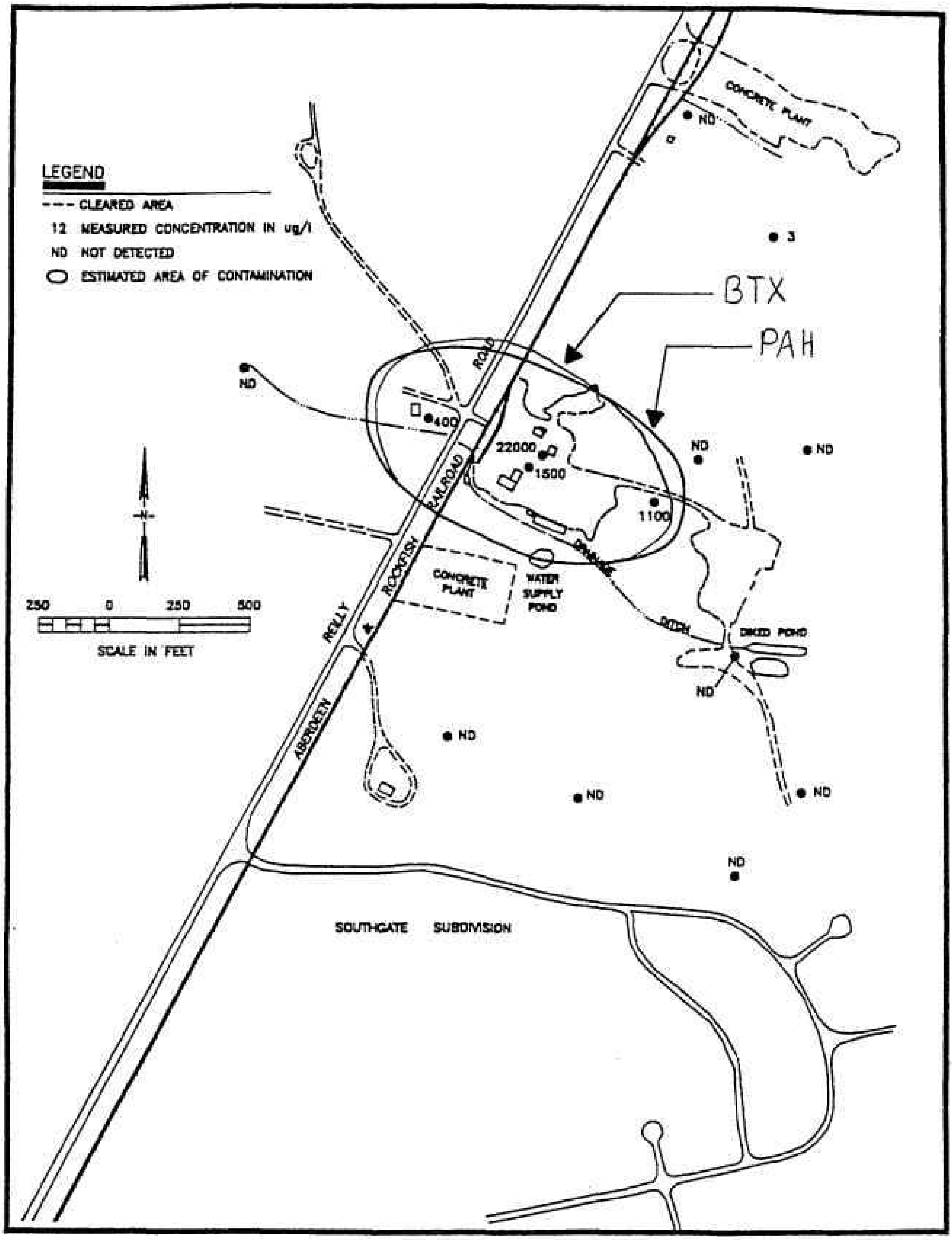
FINGERS: The 80-foot long trench is supplemented with three (3) extensions to provide a preferential pathway for the migration of contaminated groundwater from areas away from the trench location. Two fingers extend diagonally from the ends of the trench to the SW and NW corners of the excavation. One finger extends perpendicular from the center of the trench to the far side of the excavation. The fingers were constructed of the same rock and fabric materials described below. The fingers were installed in shallow (12-18 inch) deep trenches, 3-4 foot wide. All fingers were rock filled and completely covered with geotextile (top to bottom).

SUBSURFACE GROUNDWATER EXTRACTION TRENCH

Length -- 80 feet (not including finger extensions)
Depth -- 6-8 feet (6-feet deep at ends, 8-foot deep in the middle)
Fabric -- TG700 (8-Oz.) 15-foot wide × 300-foot wide 1½ rolls

Width -- 36-inches
Fill -- No. 4 rock - 175 tons

FIGURE 3 ORIENTATION AND LOCATION OF FRENCH DRAIN



PLUME BOUNDARIES FOR BTX AND PAHS IN THE 1989 ROD	**FIGURE 4**

TABLE 1 - SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR 1989 ROD

REMEDIAL ALTERNATIVE DESIGNATION	ALTERNATIVE DESCRIPTION	TECHNICAL CONSIDERATIONS	PUBLIC HEALTH & ENVIRONMENTAL CONSIDERATIONS		INSTITUTIONAL CONSIDERATIONS	ESTIMATED TIME FOR IMPLEMENTATION (YEARS)	COST (MILLIONS $)	
			SHORT-TERM REMEDIATION IMPACTS	LONG-TERM REMEDIATION IMPACTS			TOTAL PRESENT WORTH	RANGED BASED ON SENSITIVITY ANALYSIS
For Groundwater & Surface Water Alternatives								
1W	No Action/Long-Term Monitoring	Does not remove or contain contaminants. ARARs are exceeded. Monitors offsite contaminant migration.	Not applicable	Not applicable	August 23, 2000 deed restriction for consumptive groundwater use.	30 (monitoring)	0.59	N/A
2W	Flocculation, Sedimentation, Filtration, Carbon Adsorption, Discharge to surface water	It is expected that cleanup goals for PAHs will be met. Contaminant concentrations for benzene, copper, chromium, and arsenic will be reduced but meeting ARARs is less certain. Testing would be required to assess the achievable contaminant reductions. Recovery of the full groundwater easements.	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockade wood- pecker (an endangered species).	NPDES permit for surface discharge.	3.6	3.40	3.25 - 3.83
3W	Flocculation, Sedimentation, Filtration, Air Stripping Carbon Adsorption, Discharge to surface water	Cleanup goals for PAHs and benzene should be met. As with Alternative 2W, final copper, chromium, and arsenic removal efficiencies must be demonstrated through testing. Recovery of the full groundwater plume will require offsite access/ easements.	Sludge generation and elimination of existing aquatic biota (if present), and air emissions containing volatile organic contaminants.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockade wood- pecker (an endangered species). Greater degree of risk reduction than 2W achieved by VOC treatment.	NPDES permit for surface discharge.	3.6	3.42	3.22 - 3.86

TABLE 1 - SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR 1989 ROD

Remedial Alternative Designation	Alternative Description	Technical Considerations	Public Health & Environmental Considerations		Institutional Considerations	Estimated Time For Implementation (Years)	Cost (Millions $)	
			Short-Term Remediation Impacts	Long-Term Remediation Impacts			Total Present Worth	Ranged Based on Sensitivity Analysis
4W	For Surface Water - Precipitation. Flocculation, Sedimentation, Filtration, For Groundwater - Filtration, Air Stripping, Carbon Adsorption, Discharge to surface water	All cleanup goals and ARARs should be met. Recovery of the full groundwater plume will require offsite access/easements.	Sludge generation and elimination of existing aquatic biota (if present), during surface water remediation. Air emissions containing volatile organic contaminants.	Greater degree of risk reduction than 2W or 3W because of treatment distinguishes between different contaminants in groundwater and surface water respectively, (organic vs. inorganic).	NPDES permit for surface water.	3.8	3.65	3.57 - 4.14
5W	Flocculation, Sedimentation, Filtration, Discharge to POTW	All cleanup goals and ARARs should be met. The most cost-effective pretreatment process should be determined by treatability testing. Recovery of the full groundwater plume will require offsite access/easements. Piping to POTW will require easements.	Sludge generation and elimination of existing aquatic biota (if present), during surface water remediation.	Greatest degree of risk reduction. Contaminated groundwater and surface water are extracted. Effluent is direct to POTW rather than site surface water.	Local POTW must accept Site waste waters.	3.6	3.14	2.84 - 3.51

TABLE 2 -- GROUNDWATER PERFORMANCE STANDARDS SPECIFIED IN 1989 ROD		
CONTAMINANT OF CONCERN	PERFORMANCE STANDARD (µg/l)	RATIONALE FOR PERFORMANCE STANDARD
Benzene	5.0	a
PAHs	14,350	c
cPAHs	10	b

PAHs – polycyclic aromatic hydrocarbons

cPAHs -- Carcinogenic PAHs

a -- Maximum Contaminant Level (MCL)

b -- Contact Laboratory Required Quantitation Limit

c -- Value derived using reverse risk assessment technique

Fg/l -- micrograms per liter (parts per billion)

When the 1989 ROD was authored, the only groundwater standard (i.e., ARAR) established either under federal of state statues/regulations was for benzene. Since 1989, the State of North Carolina has established a number of groundwater protection standards including several for some of the contaminants of concern at the Cape Fear site. Consequently, the Agency feels it is appropriate to update the groundwater performance standards as part of this ROD Amendment. **Table 3** lists the revised ARARs for the Cape Fear groundwater clean-up effort.

4.0 1999 - 2000 GROUNDWATER REMEDIAL DESIGN EFFORT

The groundwater RD reassessment was conducted in several steps. The first step involved the collection of additional Site specific data from the field. The second step involved the use of a computer model to assess how the aquifer and the contaminants in the plume would react (move) under different pumping scenarios. The third step was to conduct a bench-scale treatability study to determine if the extracted groundwater can be treated using a biological system. The fourth step was to compile all the above information into a revised groundwater RD.

During February and March of 2000, additional field investigation activities were performed as part of the reassessment of the groundwater RD. This field work included the installation and sampling of 20 temporary monitoring wells; the collection of soil samples from three soil borings for assessment of the lithology of the underlying formation at the Site; and the collection of groundwater samples from two hydropunchs, ten piezometers, two permanent monitoring wells, and one extraction well. The first part of this investigation focused on delineating the lateral and vertical extent of the contaminant plume and better defining the contaminant levels throughout the plume. **Figure 5** depicts the results of this field effort. In comparing the size of the benzene plume between the two figures, **Figures 4** and **5**, it appears the benzene plume in **Figure 5**

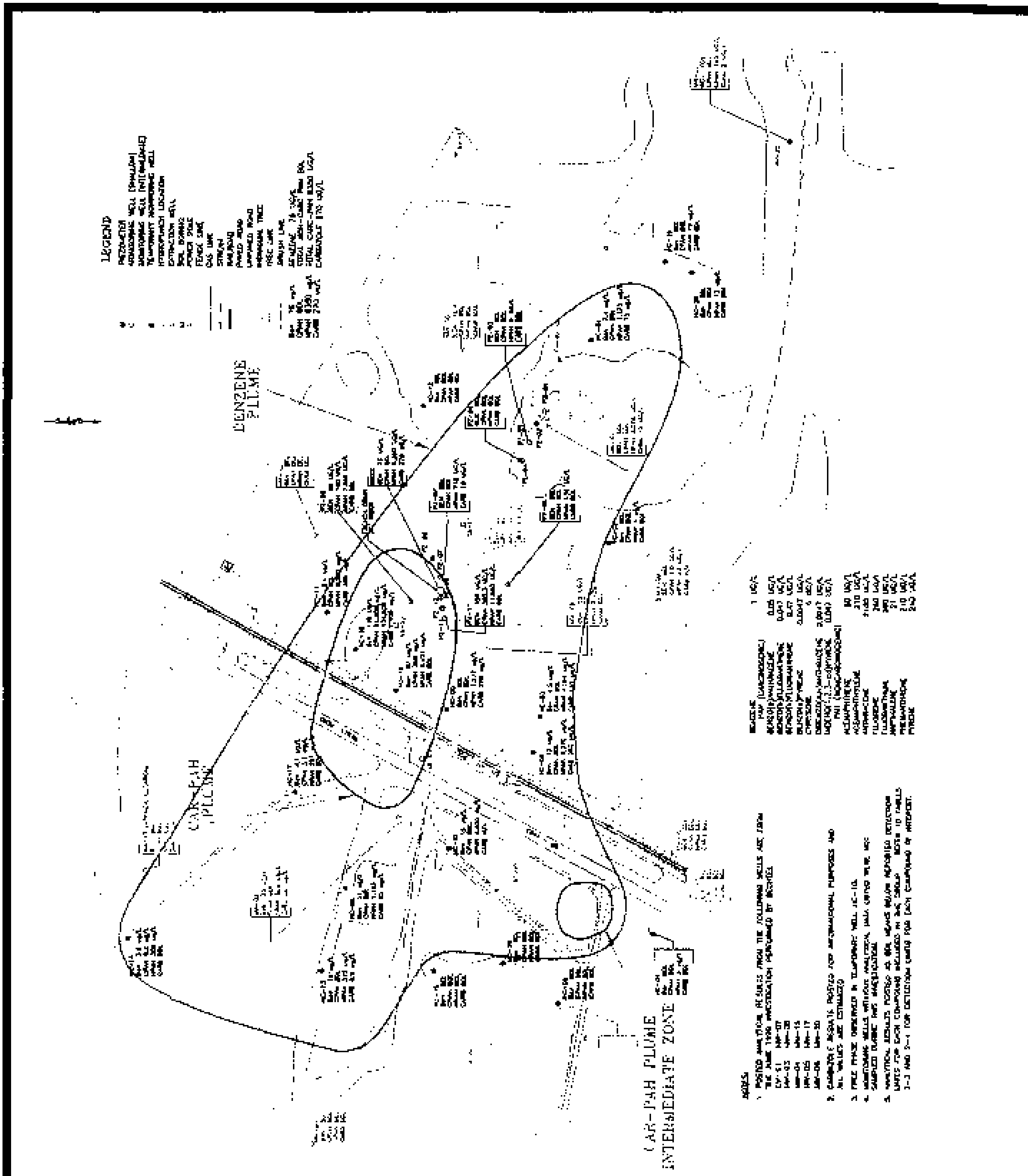


FIGURE 5 -- CURRENT PLUME BOUNDARIES SHOWING THE EXTENT OF BENZENE AND PAH CONTAMINATION IN THE SHALLOW AQUIFER

encompasses a larger area. The primary reason for this occurrence is that the revised performance standard (concentration) for benzene, 1.0 Fg/l (microgram/liter), was used instead of the performance standard, 5 Fg/l, specified as the clean-up goal for benzene in the 1989 ROD. Refer to Sections 3.2 and 5.4 for the rationale for revising the benzene performance standard. In comparing the 1989 PAH plume boundary (**Figure 4**) with the current PAH plume boundary (**Figure 5**), this plume has not altered much with the passage of time. Again, both plumes reflect the radial flow of groundwater emanating from the Site.

The second part involved two aquifer pump tests. These pumps tests were conducted to better quantify the following key parameters of the aquifer: hydraulic conductivity, transmissivity, and storage. Site specific values of these key parameters are needed to develop an accurate groundwater computer model.

The first aquifer pump tests was conducted on the french drain system which was installed during the soil remediation and the second pump test was conducted on a newly installed extraction well. Groundwater samples were collected during these pump tests to ascertain what levels of contaminants the groundwater treatment system must be capable of treating during the actual operation of the groundwater extraction system. A 55-gallon drum was filled with groundwater near the end of the pump test on the french drain. This drummed groundwater was used in the bench-scale treatability study.

The second step of the groundwater RD reassessment involved running a computer model using different pumping and discharge scenarios. The computer model manipulated the movement of both groundwater and the contaminants within the aquifer. Twenty scenarios were modeled in order to evaluate and optimize the number and configuration of extraction wells, infiltration galleries and/or reinjection wells including a variety of pumping rates. The final groundwater RD incorporates the number and location of the extraction wells and infiltration galleries as well as the pumping rates of the scenario that provided the most effective results. This was scenario #20. The major components of scenario #20 include:

- extraction of contaminated groundwater and dense non-aqueous phase liquid (DNAPL) through recovery (extraction) wells and the french drain and

- discharge water back in the aquifer through infiltration galleries located within the boundaries of the plume.

The anticipated pumping rate for the entire groundwater extraction/treatment system is 43 gallons per minute (gpm).

The bench-scale treatability study was conducted concurrently with the computer modeling. The primary objective of the treatability study was to determine the effectiveness of an enzyme-enhanced biological treatment system for treating the groundwater. The treatability study was split into three (3) tests. The goal of the first test was to determine if the enzyme-enhanced biological process could remove the existing levels of non-carcinogenic PAH compounds,

TABLE 3 -- REVISED PERFORMANCE STANDARDS FOR CONTAMINANTS OF CONCERN IN THE GROUNDWATER			
CHEMICAL OF CONCERN	PERFORMANCE STANDARDS (CLEANUP GOALS) (µg/l)	POINT OF COMPLIANCE	BASIS OF STANDARD
VOLATILE ORGANIC COMPOUNDS			
Benzene	1	Across Entire Site	15A NCAC 2L
CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)			
Benzo(a)anthracene	0.05	Across Entire Site	15A NCAC 2L
Benzo(b)fluoranthene	0.047	Across Entire Site	15A NCAC 2L
Benzo(k)fluoranthene	0.047	Across Entire Site	15A NCAC 2L
Benzo(a)pyrene	0.0047	Across Entire Site	15A NCAC 2L
Chrysene	5	Across Entire Site	15A NCAC 2L
Dibenzo(a,h)anthracene	0.0047	Across Entire Site	15A NCAC 2L
Indeno(1,2,3-cd)pyrene	0.047	Across Entire Site	15A NCAC 2L
NON-CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)			
Acenaphthene	80	Across Entire Site	15A NCAC 2L
Acenaphthylene	210	Across Entire Site	15A NCAC 2L
Anthracene	2,100	Across Entire Site	15A NCAC 2L
Fluorene	280	Across Entire Site	15A NCAC 2L
Fluoranthene	280	Across Entire Site	15A NCAC 2L
Naphthalene	21	Across Entire Site	15A NCAC 2L
Phenanthrene	210	Across Entire Site	15A NCAC 2L
Pyrene	210	Across Entire Site	15A NCAC 2L

Fg/l -- microgram per liter (parts per billion)
NCAC 2L -- North Carolina Administrative Code specifying State Groundwater Classification & Standards

carbazole, and BTEX (benzene, toluene, ethylbenzene, and xylene) from the groundwater. The goal of the second test was to determine if this system could achieve the same results using groundwater that was spiked with carcinogenic PAH compounds. Both tests were successful. The goal of the third test was to determine what affect the addition of a primary substrate to promote co-metabolic degradation would have on the degradation of the carcinogenic PAHs. Based on the results of these tests, the treatability study concluded that the levels of carcinogenic PAHs, non-carcinogenic PAHs, BTEX, and carbazole found in the groundwater at the Cape Fear site can be effectively reduced via a biological reactor to levels that will allow the treated groundwater to be re-introduced back into the formation via infiltration galleries.

4.1 COMPONENTS OF THE REVISED GROUNDWATER REMEDIATION ALTERNATIVE

Based on the reassessment of the groundwater RD, the active portion of the RD has been altered to include the following components:

- extraction of contaminated groundwater and DNAPL through six (6) recovery (extraction) wells and the french drain;
- treatment of extracted groundwater to levels necessary for discharge (actual treatment technology/process to be determined by RA subcontractor);
- amending treated water with nutrients and oxygen;
- discharge amended water back in the aquifer through eleven (11) infiltration galleries located within the boundaries of the plume;
- injection of ambient air (air sparging) into unsaturated soils through twelve (12) air sparge wells evenly spaced throughout the dissolved phase plume;
- the installation of 11 monitoring wells (or piezometers); and
- monitored natural attenuation (NMA) of the deeper aquifer.

No air sparging wells will be placed in the vicinity of the potential DNAPL plume. The actual number of recovery wells, infiltration galleries, air sparging wells, and monitoring wells may be changed based on data gained as the system goes through shake-down, start-up, and long-term operation.

In addition to the changes listed above, the groundwater performance standards (clean-up goals) have been updated. **Table 3** provides the new performance standards.

5.0 RATIONALE FOR FUNDAMENTAL CHANGES TO 1989 RECORD OF DECISION

This section highlights the data and information collected/generated during the reassessment of the groundwater RD. As stated in Section 1.0, this ROD Amendment justifies making the following five fundamental changes to the groundwater alterative at the Cape Fear site:

* Discharge treated groundwater on-site through infiltration galleries and, when necessary, to the POTW;

  - Amend the treated water with nutrients and oxygen prior to on-site discharge back into the underlying aquifer to promote in-situ bioremediation;

  - Implement air sparging to enhance the removal/destruction of benzene;

  - Monitored natural attenuation of organic contaminants in the lower aquifer; and

  - Revise groundwater performance standards to reflect new State groundwater standards.

Section 3.1 reviews the groundwater remedial alternatives evaluated for the 1989 ROD, as altered by the May 1996 ESD (ESD #3). Section 4.0 summarizes the work performed as part of the groundwater RD reassessment. The major components of the revised RD can also be found in Section 4.0. This section provides the rationale for the fundamental changes to the groundwater alternative.

5.1 DISCHARGE OF TREATED GROUNDWATER

The May 1996 ESD specified that treated water emanating from the Site should be discharged to the local POTW which is owned and operated by the City of Fayetteville/Cumberland County. This ROD Amendment selects the use of infiltration galleries as the preferred discharge option for treated groundwater with discharge to the POTW as a secondary option. In accordance to North Carolina regulations, the infiltration galleries will be located within the boundaries of the plume. By discharging the treated groundwater to these infiltration galleries, the following goals will be accomplished: reduce the overall cost of the remedy by reducing or eliminating discharge fees and potentially accelerating Site clean-up through the promotion of in situ biodegradation of the contaminants in the aquifer. Discharge to the local POTW would occur if repair work on the infiltration galleries was required.

Cost savings will be gained in two (2) areas. The first is in the savings of not having to pay for the discharge of a waste stream (i.e., treated groundwater) to the sewer system. A POTW system typically charges on a 1,000 gallon basis. This will reduce the annual O&M cost of the system. A second savings in cost will be realized if the treated water being discharged through the infiltration galleries promotes in situ biodegradation of the contaminants. The prospect of promoting and sustaining in situ biodegradation will be enhanced by the addition of nutrients/

oxygen to the effluent prior to being released into the subsurface. By promoting in situ microbial activity, the time frame needed to achieve the groundwater performance standards should be reduced, thereby, reducing the time it should take to achieve the groundwater performance standards. Although the equipment to add nutrients and oxygenate the effluent and the nutrients themselves will increase the cost, cost savings should be realized by reducing the length of the project.

5.2 AIR SPARGING

Based on the sampling effort during February-March of 2000 and applying the North Carolina groundwater standard for benzene, the boundaries of the benzene plume have expanded since they were first delineated by the 1988 RI. Benzene, a volatile organic compound, is readily biodegraded by microorganisms. Biodegradation of benzene occurs at a faster rate under aerobic conditions than anaerobic conditions. Installing an air sparging system within the benzene plume at the Site will accomplish two (2) objectives. First, air sparging will accelerate the physical removal of benzene from the water column and soils through volatilization. As air is pumped into the subsurface, the air will move through the pore spaces in the geologic formation and subsequently volatilize the benzene [i.e., transfer the benzene from liquid phase (dissolved in water) to vapor phase]. The air and low concentration benzene vapor subsequently rise to the ground surface where they are harmlessly emitted into the atmosphere.

Secondly, the air being pumped into the formation will provide oxygen to the subsurface environment, thereby helping to create and maintain an aerobic environment in the subsurface. Consequently, the combination of using the air sparging wells and the discharge of nutrient enriched treated water via infiltration galleries should help promote and sustain a favorable environment for in situ biodegradation of BTEX and PAHs.

5.3 MONITORED NATURAL ATTENUATION

The Agency has determined that implementing an active remediation system in the lower aquifer may result in moving contamination currently found in the upper aquifer into the lower aquifer. To date, very low concentrations of contaminants of concern have been detected in the lower aquifer. Therefore, to prevent pulling the mass of contamination deeper, the Agency proposes monitored natural attenuation for the contamination detected in the lower aquifer. In addition, as demonstrated in the treatability study, the chemicals of concern are biodegradable which should result in their destruction through natural processes without the need for mechanical removal. Additional monitoring of the lower aquifer will be needed in order to fulfill the data needs highlighted in OSWER Directive 9200.4-17, “Use of Monitored Natural-Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites”, April 21, 1999.

5.4 REVISED GROUNDWATER PERFORMANCE STANDARDS

At the request of NCDENR and in accordance to the NCP, §300.430(f)(1)(ii)(B)(1), the groundwater performance standards have been revised to reflect the current groundwater standards specified in the North Carolina Administrative Code (NCAC 2L) -- State of North Carolina Groundwater Classification & Standards.

5.5 SUMMARY OF FUNDAMENTAL CHANGES

The previous sections highlighted the changes to be incorporated into the Cape Fear ROD via this ROD Amendment. This section presents the new groundwater remediation alternative for addressing the contaminated groundwater at the Site.

6.0 SUMMARY OF COMPARATIVE ANALYSIS OF PROPOSED CHANGES

This section compares the 1989 ROD remedial alternative for groundwater (i.e., the original remedy) highlighted in Section 3.0 to the remedial alternative presented in the November 8, 2000 ROD Amendment Fact Sheet (detailed in Section 4. 1). The comparison between these two (2) alternatives is based upon the nine (9) criteria specified in the NCP.

6.1 THRESHOLD CRITERIA

In order for an alternative to be eligible for selection, it must be protective of both human health and the environment and comply with ARARs unless either one or both of these requirements are waived. If an alternative fails to protect human health or the environment, or does not comply with ARARs, then this alternative cannot be selected. Below is a discussion of the alternatives in comparison with these two threshold criteria.

6.1.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

This criterion assesses the alternatives to determine whether they can adequately protect human health and the environment from unacceptable risks posed by the contamination at the Site. This assessment considers both short-term and long-term time frames.

Under current conditions, the groundwater does not pose as an unacceptable risk to human health or the environment. However, under the future use scenarios developed for the Site in the Risk Assessment, groundwater could pose a significant risk to human health if groundwater under the Site was used as potable water. Both alternatives remove and treat the contaminants in the plume and prevent the further migration of contaminated groundwater. Both of these alternatives will be protective of human health and the environment.

6.1.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

This criterion assesses the alternatives to determine whether they attain ARARs or provide a justification for waiving an ARAR. Site-specific ARARs are identified below.

Maximum contaminant levels (MCLs) and groundwater standards specified in NCAC 2L are ARARs for Site groundwater. Both the original alternative and the amended alternative are designed to obtain ARARs throughout the entire Site. Construction of the groundwater recovery, treatment, and discharge system for both alternatives will satisfy action-specific ARARs. The disposal of any sludge or spent activated carbon generated by either system would also comply with ARARs.

The only location-specific ARAR, construction of the groundwater treatment system within a 100-year flood plain, pertains to both alternatives.

The original RD had all treated groundwater being discharged to the local POTW via a discharge permit to be issued by the POTW. The revised RD has the treated groundwater being discharged into infiltration galleries. The chemical quality of the effluent and the location of the infiltration galleries will be in accordance to North Carolina regulations. Any discharge to the City of Fayetteville POTW by the revised RD will be done under a permit issued by the POTW and will satisfy the requirements set forth in the Clean Water Act (33 U.S.C. § 1251-1376).

6.2 PRIMARY BALANCING CRITERIA

These criteria are used to evaluate the overall effectiveness of each particular remedial alternative.

6.2.1 LONG-TERM EFFECTIVENESS AND PERMANENCE

This criterion assesses the long-term effectiveness and permanence of an alternative as well as the degree of certainty to which the alternative will prove successful.

Both alternatives will be permanently reduce contaminant concentrations in the groundwater through the groundwater extraction and treatment. It is anticipated that the revised alternative will reduce the time required to obtain the performance standards through promoting in-situ degradation and air sparging.

6.2.2 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

This criterion assesses the degree to which the alternatives employ recycling or treatment to reduce toxicity, mobility, and volume of the contaminants present at the Site.

Both alternatives would effectively reduce the mobility and volume of contaminants in the aquifer through groundwater recovery. Both alternatives will reduce/remove the toxicity of contaminants in the groundwater by an on-site groundwater treatment system. The revised alternative strives to promote and sustain in-situ biodegradation of the contaminants by adding nutrients and oxygen to the treated water prior to being discharged into the infiltration galleries. Both alternatives comply with the statutory preference for reducing the toxicity, mobility, and volume of the contaminants at a Site.

6.2.3 SHORT-TERM EFFECTIVENESS

This criterion assesses the short-term impact of an alternative to human health and the environment. The impact during the actual implementation of the Remedial Action usually is centered under this criterion.

Both alternatives can be implemented without significant risk to the community or on-site workers and without adverse environmental impacts. Under the revised alternative on-site workers would be exposed to some additional physical risk during the construction of the infiltration galleries.

6.2.4 IMPLEMENTABILITY

This criterion assesses the ease or difficulty of implementing the alternatives in terms of technical and administrative feasibility and the availability of services and materials.

Neither revised alternative poses significant concerns regarding implementation. The revised alternative is a more complicated system as it involves additional components: infiltration galleries, air sparging wells, and the promotion of in-situ biodegradation. Therefore, more effort will be needed to operate and maintain the revised alternative.

6.2.5 COST

This criterion assesses the cost of an alternative in terms of total present worth cost. Total present worth was calculated by combining the capital cost plus the present worth of the annual operation and maintenance (O&M) costs. Capital cost includes engineering and design, mobilization, Site development, equipment, construction, demobilization, utilities, and sampling/analyses. Operating costs were calculated for activities that continue after completion of construction, such as routine operation and maintenance of treatment equipment, and groundwater monitoring. The present worth of an alternative is the amount of capital required to be deposited at the present time at a given interest rate to yield the total amount necessary to pay for initial construction costs and future expenditures, including O&M and future replacement of capital equipment.

The estimated total present worth cost for the original alternative (as modified by the three ESDs) was $3,040,000. Below is a breakdown. of the sub-costs. This alternative included extracting contaminated groundwater, on-site treatment, and discharge to the local POTW.

Construction Costs	$ 1,000,000
15% Contingency	$ 150,000
Award Fee (5%)	$ 50,000
Anticipated Annual O&M	$ 130,000
Oversight of RA	$ 700,000
Yearly Oversight of O&M Activities	$ 100,000
TOTAL (includes 8 years of O&M Costs)	$ 3,040,000

The estimated cost of the revised alternative is $ 5,318,000. This alternative involves the following components: extracting contaminated groundwater, on-site treatment, addition of nutrients to the treated groundwater, discharge of treated groundwater into on-site infiltration galleries, and air sparging wells. The sub-costs of this alternative include:

Construction Costs	$ 1,405,000
15% Contingency	$ 210,750
Award Fee (5%)	$ 70,250
Anticipated Annual O&M	$ 238,000
Oversight of RA	$ 768,000
Yearly Oversight of O&M Activities	$ 120,000
TOTAL (includes 8 years of O&M Costs)	$ 5,318,000

As can be seen, the cost of the revised groundwater remedy is more than the cost of the groundwater remediation proposed in the 1989 ROD. The difference can be accounted for in the fact that the revised groundwater remediation has more components which increases both the capital (construction) costs as well as the O&M costs. The estimated construction cost for the revised remedy is $1,405,000 where the cost of the original remedy was only 1,000,000. The second major difference is in the annual O&M costs. The calculated annual O&M cost for the revised remedy is $238,000 which is approximately $100,000 more than the O&M cost for the original remedy. Over a period of 8 years, this difference amounts to $800,000. The above differences are defensible as the revised remedy involves a number of different technologies that require more maintenance and has a better chance of achieving the ultimate goal, achieving groundwater performance standards throughout the entire plume.

6.3 MODIFYING CRITERIA

State and community acceptance are modifying criteria that shall be considered in selecting the Remedial Action.

6.3.1 STATE OF NORTH CAROLINA ACCEPTANCE

The State of North Carolina has reviewed and provided EPA with comments on the reports and various renderings of the RD. North Carolina Department of Environment and Natural Resources (NCDENR) also reviewed the November 8, 2000, ROD Amendment Fact Sheet and attended the November 14, 2000, Proposed Plan public meeting. The State concurred with the proposed remedy and the State's concurrence letter is attached as Appendix C.

6.3.2 COMMUNITY ACCEPTANCE

The ROD Amendment Fact Sheet was distributed to interested residents, local newspapers, radio and TV stations, and to local, State, and Federal officials on November 8, 2000. A ROD Amendment public meeting was held in the evening of November 14, 2000. The public comment period on the proposed ROD Amendment began November 14, 2000, and closed on December 14, 2000. Eight (8) citizens attended the Proposed Plan meeting held at the Cliffdale Branch Library.

No written comments were received during the public comment period. The questions asked during the November 14, 2000, public meeting are summarized in the Responsiveness Summary, Appendix B. The community appears to be in favor of the amended remedy.

7.0 DESCRIPTION OF THE AMENDED REMEDY

Section 4.1 provides a detailed description of the revised RD. Briefly, the revised remedy for the Site is:

GROUNDWATER REMEDIATION

The revised remedy for addressing contaminated groundwater includes:

- installation of an anticipated six (6) recovery wells, 3 on-site and 3 off-site;
- extracting groundwater from the recovery wells and the french drain;
- one of the on-site recovery wells will be capable of removing a DNAPL (the french drain may also be so equipped);
- construction of an anticipated eleven (11) infiltration galleries, 8 on-site and 3 off-site, to allow for the discharge of treated groundwater (using infiltration galleries will enhance the capture of contaminated groundwater and promote in situ biodegradation of the organic contaminants);
- construction of an on-site building to house the groundwater treatment system;
- on-site treatment of groundwater to the degree necessary to allow the treated groundwater to be discharged into the infiltration galleries (the treatment system/process is a performance based specification in the RD, therefore, the actual treatment system will be determined by the RA subcontractor);

- prior to being discharge into the infiltration galleries, the treated water will have nutrients added and the water will be oxygenated to promote and sustain in situ biodegradation of the organic contaminants;

- when necessary, the treated groundwater will be discharged to the local POTW under a permit issued by the POTW;

- installation of twelve (12) air sparging wells, 7 on-site and 5 off-site, to help sustain in-situ biodegradation as well as promote physical removal of benzene from the underlying geology; and

- installation of additional monitoring wells/piezometers [approximately eleven (11)] to allow complete monitoring of the groundwater remedial action.

Figure 6 provides the locations of the components of the groundwater remediation system.

7.1 PERFORMANCE STANDARDS TO BE ATTAINED

This ROD Amendment has updated the groundwater performance standards. The revised performance standards are presented in **Table 3**.

7.2 COST

The total cost for the amended remedy is $ 5,318,000.00. The break down of this cost is specified in Section 6.2.5 above.

8.0 STATUTORY DETERMINATION

The amended remedy satisfies the requirement of Section 121 of CERCLA, 42 U.S.C. § 9621, and the NCP § 300.430, 40 CFR § 300.430, providing protection of human health and the environment, attaining ARARs of other environmental statutes, will be cost effective, and will utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Sections 8.1 through 8.5 below analyze the statutory requirements.

8.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will treat the groundwater and permanently remove or minimize the potential risk associated with the contaminants. Dermal, ingestion, and inhalation contact with Site contaminants will be eliminated and risks posed by continued groundwater contamination will be abated.

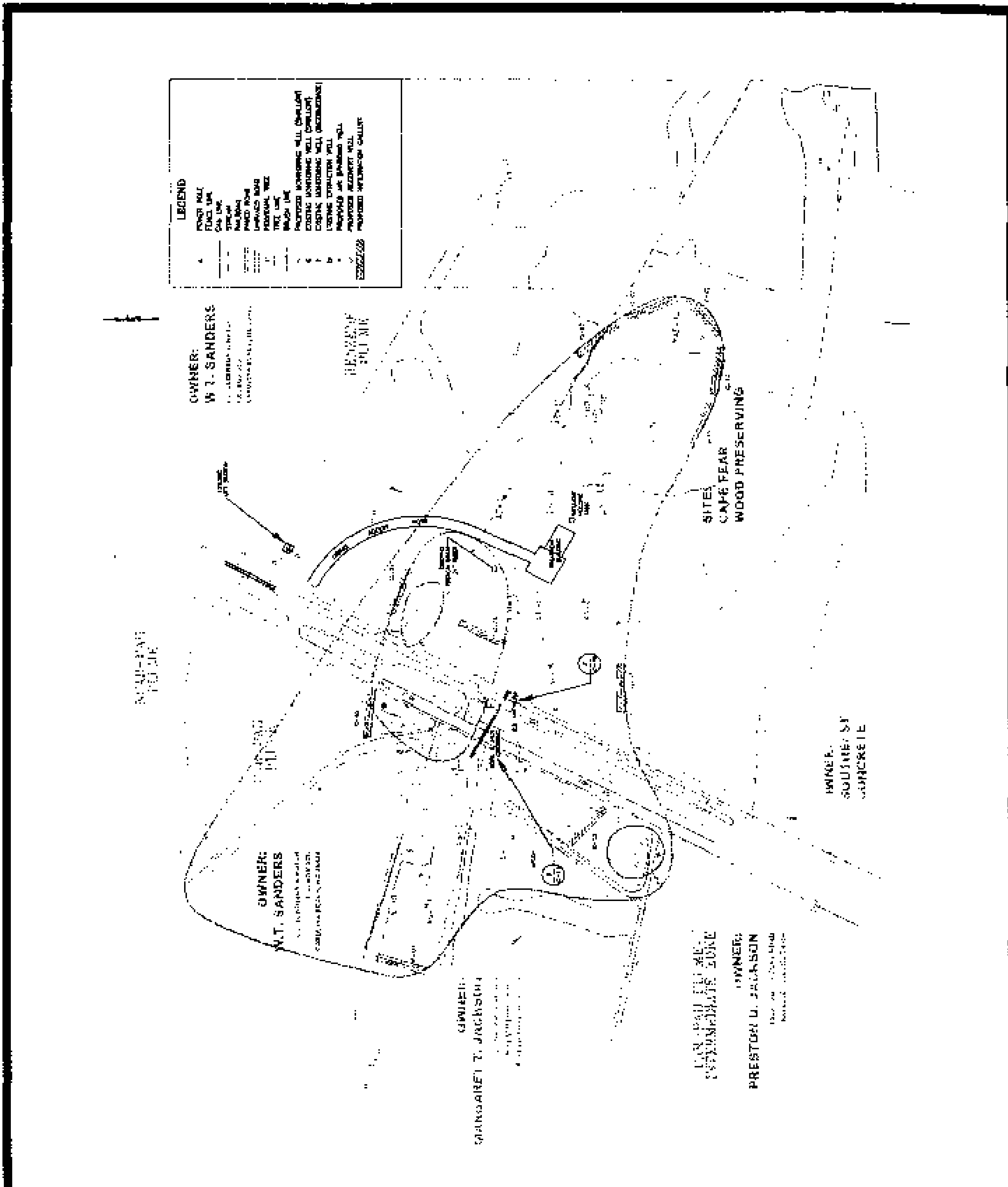


FIGURE 6 -- LAYOUT OF COMPONENTS OF THE GROUNDWATER REMEDIATION SYSTEM

8.2 COMPLIANCE WITH ARARS

The amended remedy will be designed to meet all Federal or more stringent State environmental laws.

8.3 COST EFFECTIVENESS

The revised groundwater remedial action is more cost-effective per unit than the original remedy. The revised design should be more effective in extracting the contaminated groundwater as well as in promoting in-situ degradation of the contamination.

8.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The amended remedy represents the maximum extent to which permanent solutions and treatment practicably can be utilized for this action.

8.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The preference for treatment is satisfied through the use of treatment on the extracted contaminated groundwater. The promotion and perpetuation of in-situ biodegradation will also fulfill this criteria.

9.0 SIGNIFICANT CHANGES

Section 117(b) of CERCLA requires an explanation of any significant changes from the preferred alternative presented to the public. Below are the specific changes made in this ROD Amendment as well as the supporting rationale for making those changes. The ROD Amendment Fact Sheet was distributed to the public on November 8, 2000. There are no none changes. However, once actual construction activities begin, it may be necessary to vary the location of some of the components due to unforeseen problems.

APPENDICES

APPENDIX A

1989 RECORD OF DECISION

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY
NORTH CAROLINA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Cape Fear Wood Preserving
Fayetteville, Cumberland County, North Carolina

Statement of Purpose

This document represents the selected remedial action for this Site developed in accordance with CERCLA as amended by SARA, and to the extent practicable, the National Contingency Plan.

The State of North Carolina has concurred on the selected Remedy.

Statement of Basis

The decision is based upon the Administrative Record for the Cape Fear Wood Preserving Site. The attached index identifies the items which comprise the administrative record upon which the selection of a remedial action is based.

Description of Selected Remedy

Prior to initiating any remedial action on-site, a site survey will be conducted to determine the presence of any endangered plant species on-site. If endangered plant species are encountered, then the Department of the Interior/U.S. Fish and Wildlife Service needs to be consulted prior to initiating remedial action to decide how to proceed.

REMEDIATION OF HAZARDOUS MATERIALS, TANKS & PIPING

> Off-site disposal of sodium dicromate - copper sulfate - arsenic pentoxide (CCA) salt crystals, the solidified creosote and asbestos-containing pipe insulation. The CCA crystals and solidified creosote will be disposed of at a RCRA permitted landfill. The asbestos-containing pipe insulation will be disposed of at the Cumberland County Solid Waste Facility pursuant to the facilities specifications.
>
> The tanks and associated piping, above and below ground, will be emptied, flushed and cleaned, including triple rinsing, to render the metal non-hazardous. The metal will then be cut and either sold to a local scrap metal dealer or disposed of at the Cumberland County Solid Waste Facility. For those tanks and/or piping that cannot be cleaned sufficiently to render them non-hazardous they will be transported to a RCRA permitted landfill for disposal.

The contents of the tanks and associated piping contains approximately 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater. A buyer of the 50,000 gallons of 3 percent CCA solution will first be pursued. If no buyer can be found, then the 50,000 gallons of 3 percent CCA solution along with the 15,000 gallons of CCA contaminated wastewater will be treated on-site through the water treatment system set up for treating the pumped surface waters and extracted groundwater. All wastewater (i.e., cleaning equipment, etc.) generated by on-site activities will also be directed to the treatment system.

SOURCE CONTROL (Remediation of Contaminated Soils)

The preferred alternative for the remediation of contaminated soils/sediment is soil washing. The alternate source control alternative is a low thermal desorption process to remove the organics contaminants from the soil followed by either soil washing or a soil fixation/solidification/stabilization process to address the inorganics. The decision as to which source control alternative will be implemented will be based on data generated by the soil washing treatability study to be conducted during the remedial design.

Contaminated soils/sediment will be excavated, treated and placed back in the excavation. All wastewater generated will either be reused or treated on-site. Following completion of on-site remedial activities, those areas disturbed will be revegetated

MIGRATION CONTROL (Remediation of Contaminated Groundwater)

Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Groundwater removal will be conducted in 10,000 square foot subareas at a time, until the entire contaminated surficial aquifer is addressed. The well points will be moved from one area to another for subsequential dewatering.

Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.

A water treatment system will be established on-site. The system’s influent will include contents of the tanks and piping, all wastewater generated due to remedial actions implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a surface stream. The range of treatment for the contaminated water includes biological degradation, air stripping, filtration through activated carbon filter, and metal removal through flocculation, sedimentation and precipitation. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluents, including both discharged water and/or air, will meet all applicable and relevant or appropriate requirements (ARARs).

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solution and alternative treatment technologies to the maximum extent practicable.

June 30, 1989
Date

Acting for Patrick M Tobin
Greer C. Tidwell
Regional Administrator

SUMMARY OF REMEDIAL SELECTION

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY
NORTH CAROLINA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

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RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA

1.0 INTRODUCTION

The Cape Fear Wood Preserving (Cape Fear) Site was proposed for the National Priorities List (NPL) in June 1986 and was finalized in July 1987 as site number 572. The Cape Fear Site has been the subject of a Remedial Investigation (RI) and a Feasibility Study (FS), both of which were conducted under the REM II contract. The RI report, which examined air, groundwater, soil, and surface water and sediment contamination at the Site and the routes of exposure of these contaminants to the public and environment was completed in October 1988. The FS, which develops, examines and evaluates alternatives for remediation of the contamination found on site, was issued in final draft form to the public in February 1989.

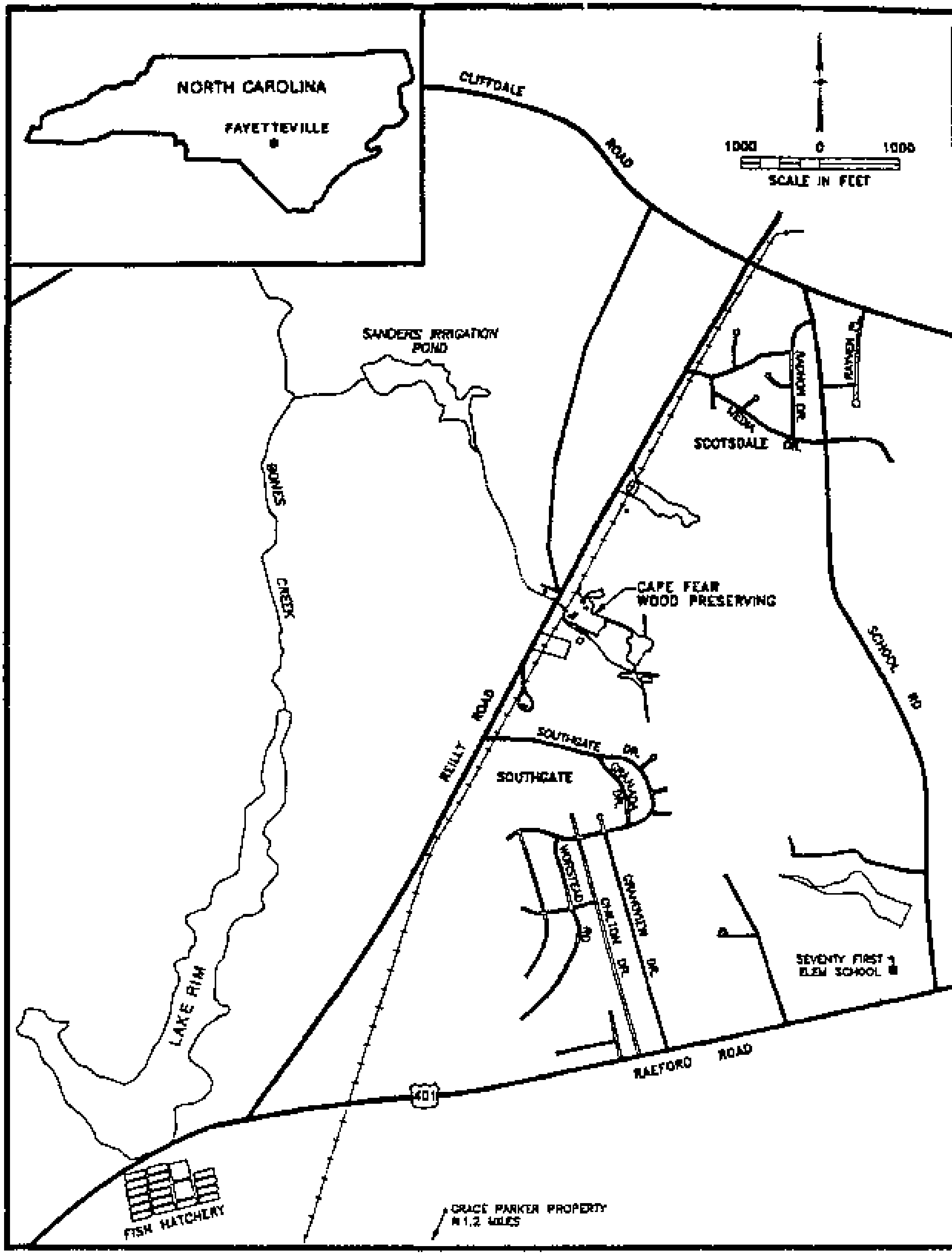
This Record of Decision has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative.

1.1 SITE LOCATION AND DESCRIPTION

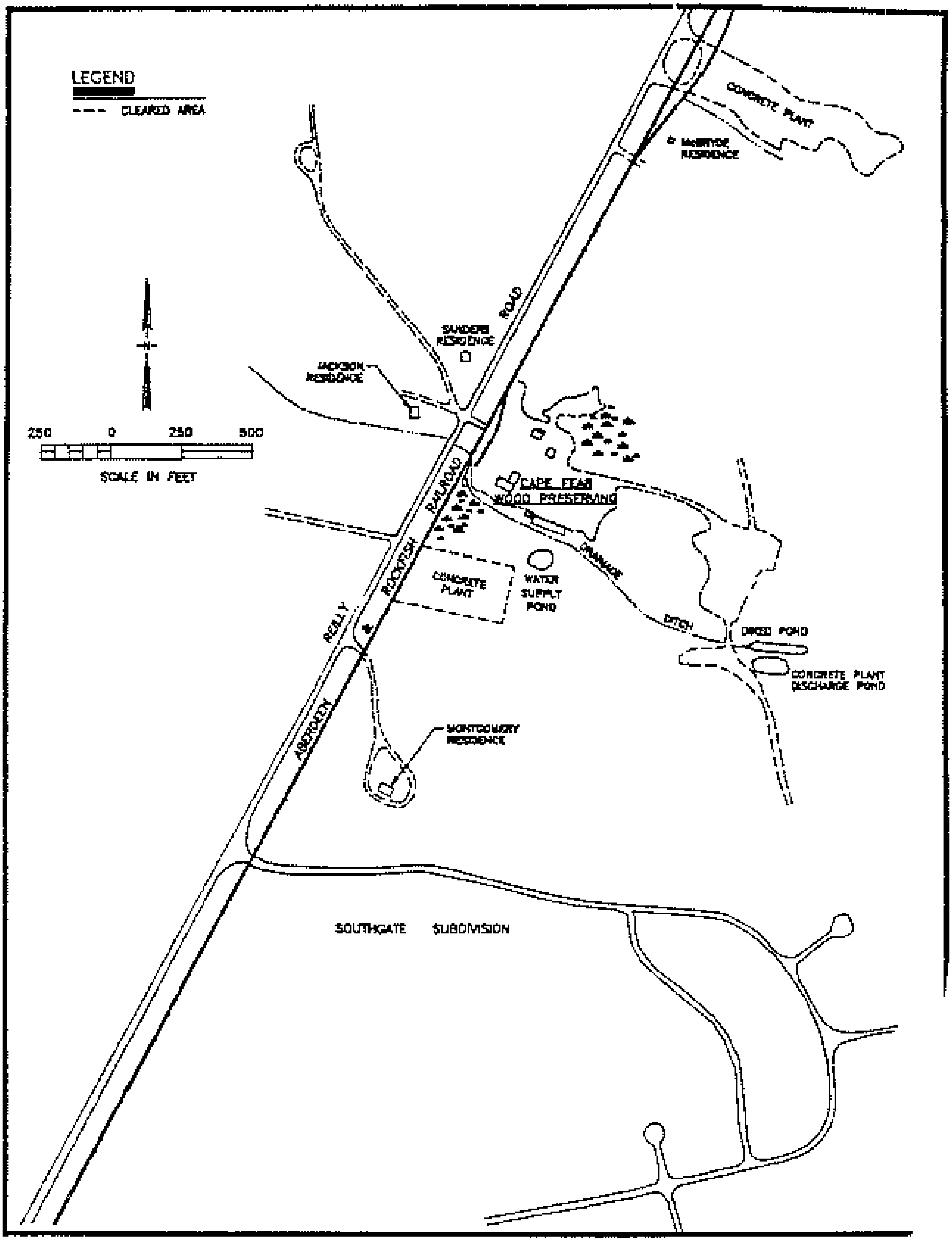
The Cape Fear Site is located in Cumberland County, North Carolina, on the western side of Fayetteville near Highway 401 (Figure 1). It includes about nine acres of a 41-acre tract of land near the intersection of latitude 35E02'57"N and longitude 79E01'17"W. The site is adjacent to other industrial/commercial establishments as well as private residences. Four homes are located near the site. In addition, a subdivision named "Southgate" is located approximately a quarter of a mile south of the site and houses approximately 1,000 people. Figures 2 and 3 show the area and major site features.

Of the approximately 41 acres comprising the site, less than 10 acres were developed by the facility. The remainder of the site is heavily wooded with coniferous trees with a small swampy area northeast of the developed area. The site is highly disturbed in the vicinity of the plant facilities. The buildings are currently abandoned and in various states of disrepair. The swampy area consists of a seasonally flooded wetland dominated by rushes. The upland section of the site is sandy and well-drained. A site survey will be required prior to initiating remedial action to determine if endangered plant species exist on-site.

The terrain of the Cape Fear Site is predominantly flat, with drainage provided by a swampy area on the northeast side of the site and a man-made ditch to the southeast that extends southeastwardly to a diked pond. A variety of land uses exist around the Cape Fear Site. The properties to the



LOCATION MAP	FIGURE NO. 1
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	



FIGUF

AREA MAP

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

north include an undisturbed pine forest, a concrete plant, and a few residential properties. To the east is a continuation of the undisturbed pine forest, and to the west is farmland used for growing crops and raising livestock. To the south is another concrete plant as well as the Southgate subdivision.

1.2 SITE HISTORY

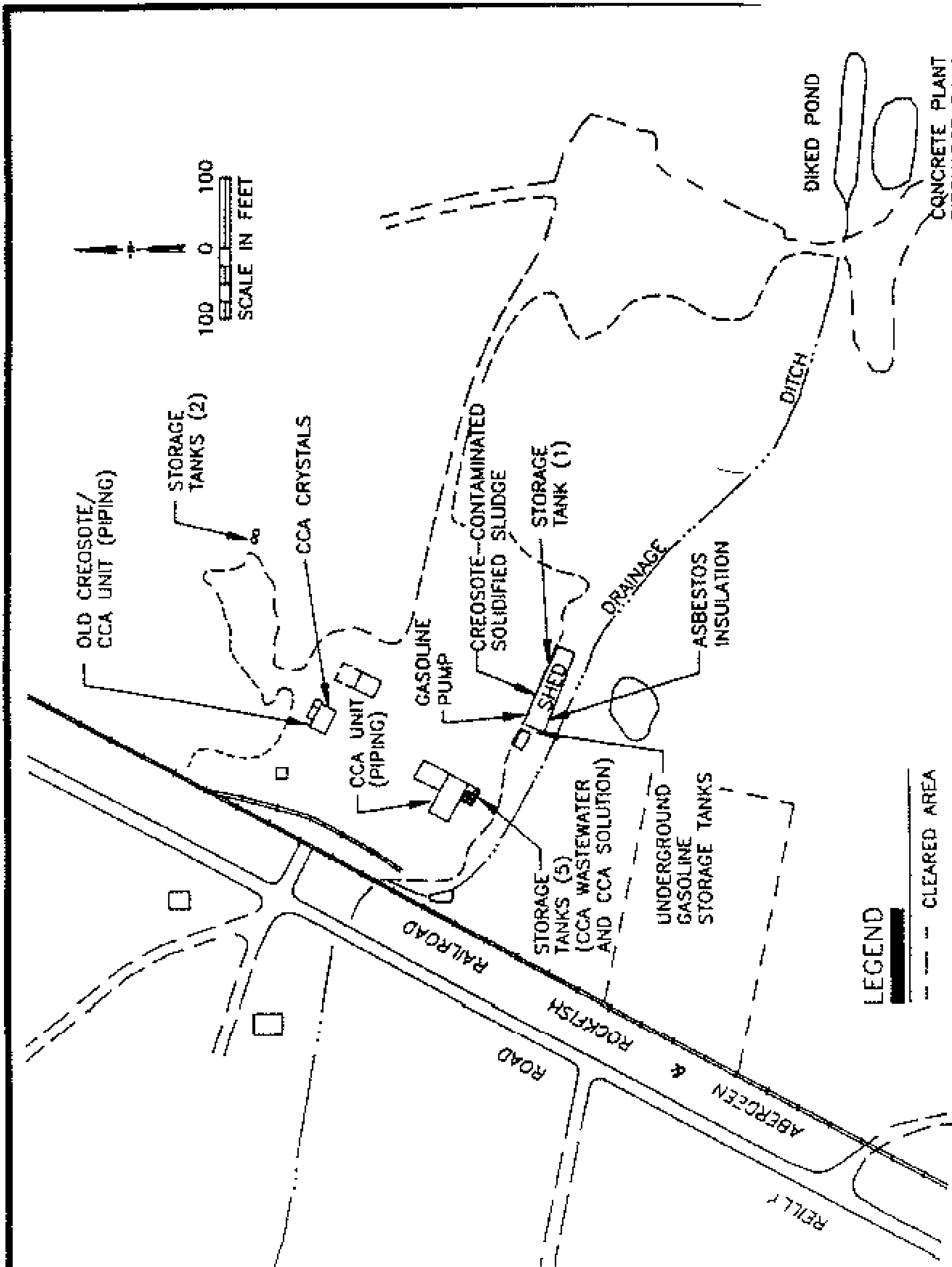
Operations at the Cape Fear Wood Preserving Site commenced in 1953 and continued until 1983. The Cape Fear Wood Preserving facility produced creosote-treated wood from 1953 until 1978 when demand for creosote-treated products declined. Wood was then treated by a wolmanizing process using salts containing sodium dichromate, copper sulfate, and arsenic pentoxide. This treatment process is known as the copper-chromium-arsenic (CCA) process. The date the CCA process was initiated is unknown. Nor is it known whether the creosote and CCA processes occurred simultaneously or in succession.

Both liquid and sludge wastes were generated by these two treatment processes. Waste from the creosote process was pumped into a concrete sump north of the treatment unit (Figure 3). As liquid separated from the sludge, it was pumped into a drainage ditch that lies southeasterly of the developed portion of the site and discharges into a diked pond. Stormwater runoff from the treatment yard also appears to drain into this ditch. Waste from the CCA treatment process was pumped into a unlined lagoon north of the dry kiln and allowed to percolate into the ground.

In the summer of 1977, the site was determined to be contaminated with constituents of coal tar and coal tar creosote. State authorities ordered the owner/operator to comply with North Carolina law. As a result, the owner/operator changed operations to limit further releases, installed a new potable water well for a neighbor west of the site, and removed 900 cubic yards of creosote-contaminated soil from the treatment yard and the drainage ditch that parallels the railroad. The creosote-contaminated soil was transported for land-spreading to property leased from Grace Parker approximately 2.5 miles south of the site. The soil on this property was sampled as part of the RI. Low levels of polycyclic aromatic hydrocarbons (PAHs) were detected.

Sometime between 1979 and 1980, a new closed-circuit CCA plant was installed and the old creosote and CCA facilities were decommissioned. The new CCA plant was regulated under the Resource Conservation and Recovery Act (RCRA) as a small generator until 1983, when the company went out of business. The site was subsequently abandoned until the summer of 1988 at which time SECo, Investment, Inc. purchased the property.

The Environmental Protection Agency (EPA) conducted a site reconnaissance and site investigation in October 1984. Surface water, groundwater, soil and sediment samples were collected from the northeast swamp, diked pond, lagoon,



SITE MAP

FIGUR

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

drainage ditch and a domestic well west of the site (S.T. Jackson). PAHs, which are creosote-related compounds, and the CCA metals were detected in all samples. Consequently, EPA conducted an emergency removal action at the site in January and February 1985. This actions included:

- Removal of creosote sludge from the creosote concrete sump;
- Removal of sludge from the lagoon to a depth of 7 feet, and solidification of the sludge with fly ash;
- Pumpage of lagoon water into storage tanks located south of the new CCA unit;
- Removal of contaminated soil from the drainage ditch that parallels the railroad tracks and at the culvert near Reilly Road;
- Removal of contaminated soils from a portion of the northeast swamp and stained areas in the treatment yard; and
- Back filling with clean sandy soil of areas where contaminated soil had been removed.

All contaminated soils and sludges removed were transported to the GSX hazardous waste landfill in Pinewood, South Carolina.

The NUS Corporation conducted an investigating of the site in May and October 1985. Soil, sediment, surface water and ground water samples were collected. Analytical results again showed that samples were contaminated with creosote-related compounds, arsenic, chromium and copper.

EPA conducted a second emergency response in September 1986 when site visits revealed that vandals had shot holes in a 3,000-gallon creosote storage tank spilling approximately 500 gallons of creosote on the ground. The cleanup operation consisted of:

- Removal, solidification, and transport of approximately 10 cubic yards of creosote-contaminated sludge to an on-site metal shed east of the new CCA unit;
- Removal and transport of the creosote storage tank to the on-site metal shed;
- Excavation and grading of the area where the creosote tank had leaked;
- Pumpage of approximately 15,000 gallons of CCA waste water from the CCA recovery sump into on-site storage tanks located south of the new CCA unit; and
- Containment of the CCA recovery sump within an earthen dike.

2.0 ENFORCEMENT ANALYSIS

Several Potentially Responsible Parties (PRPs) have been identified, including the Cape Fear Wood Preserving Company (no longer active), Johnson & Geddes Construction Company (no longer active), John R. Johnson, Doretta Ivey (wife of former president of the Cape Fear Wood Preserving Company -- deceased), and Dewey Ivey, Jr. (son of the former president -- deceased). Recently identified PRPs include SECO Investments, Inc. (SECO), Southeastern Concrete Products, Inc. (SE-Lum), Southeastern Concrete Products of Fayetteville, Inc. (SE-Fay), Mr. Steve Floyd, Mr. Louis Lindsey, and Mr. James Musselwhite.

In December 1984, EPA issued notice letters to the PRPs informing them of EPA's intention to conduct CERCLA remedial activities at the site unless the PRPs chose to conduct such actions themselves. The PRPs were sent notice letters rather than an administrative order because of their presumed inability to pay for remedial action. On June 5, 1989, these PRPs were sent RD/RA notice letters informing them that the Agency was considering spending Fund monies if they no not or incapable of conducting the project themselves.

3.0 CURRENT SITE STATUS

The site was abandoned from 1983 until the summer of 1988 when it was purchased by SECo, Investments, Inc. Presently, an area of approximately 10,000 square feet of the site near the railroad tracks has been enclosed by a chained linked fence. Within the fence are some small earth-moving equipment and a concrete pad with a storage trailer on top. This area is rented to Southern Concrete Products, Inc.

In the fall of 1988 and at the direction of a Cumberland County building/construction inspector, the owner retrenched the majority of the drainage ditch, dug several new drainage trenches and breached the diked pond. Both the drainage ditch and the sediments within the drainage ditch and the diked pond and the sediments within the diked pond were areas targeted for remediation.

3.1 HYDROGEOLOGIC SETTING

The study area is underlain by two major stratigraphic formations: the Tuscaloosa and the Black Creek Formations. The Tuscaloosa Formation appears to rest directly on a basement rock complex and is mainly a massive clay unit containing interbedded layers of sand. The Black Creek Formation overlies the Tuscaloosa Formation and typically consists of thin layers of brownish to black clay alternating with thin layers of gray to white fine-grained quartz sand. The contact between the Black Creek beds and the Tuscaloosa clay is unconformable. In addition, the lithology of these formations is so similar, it is very difficult to differentiate between the formations based on visual inspection.

The Tuscaloosa and Black Creek Formations are overlain by undifferentiated surficial sediments. In the study area, the surficial sediments have a maximum thickness of 30 feet. These beds generally consist of unconsolidated, fine to medium-grained sand in a clay matrix.

Geologic logs recorded during monitor well and borehole installations indicate that the site is underlain by intermittent beds of sands, clays, and sands in clay matrices. One distinct clay to silty, sandy clay semi-confining unit, however, was identified. This unit divides the subsurface down to a depth of approximately 90 feet into two water producing zones.

The upper aquifer consists of unconsolidated sands and clays and is approximately 25 feet thick. The lower aquifer also consists of sands and clays and is approximately 50 feet thick. Separating the aquifers is a clay to silty, sandy clay semi-confining unit, approximately 15 feet thick, which acts as an aquitard. This unit is generally continuous across the site, but was reporting missing in one location along the access road. Underlying the lower aquifer is a stiff clay unit of unknown thickness, which is assumed to act as an aquiclude or aquitard based on physical descriptions of the material. This unit appears to be continuous across the entire site.

It has been determined that the groundwater flow in the lower aquifer is generally southwestward at the site (Figure 4) while groundwater flow in the upper aquifer is radial, moving in all directions from the site (Figure 5). This radial flow pattern in the upper aquifer is probably due to a combination of two geologic conditions:

Most of the steams in the study area have flood plains. Some have terraces that range in width from a few feet to several miles. Along each stream, the present flood plain width varies in response to geologic control, but the stream, flood plain, terraces, and valleys generally become wider downstream. The site does not lie within a floodplain.

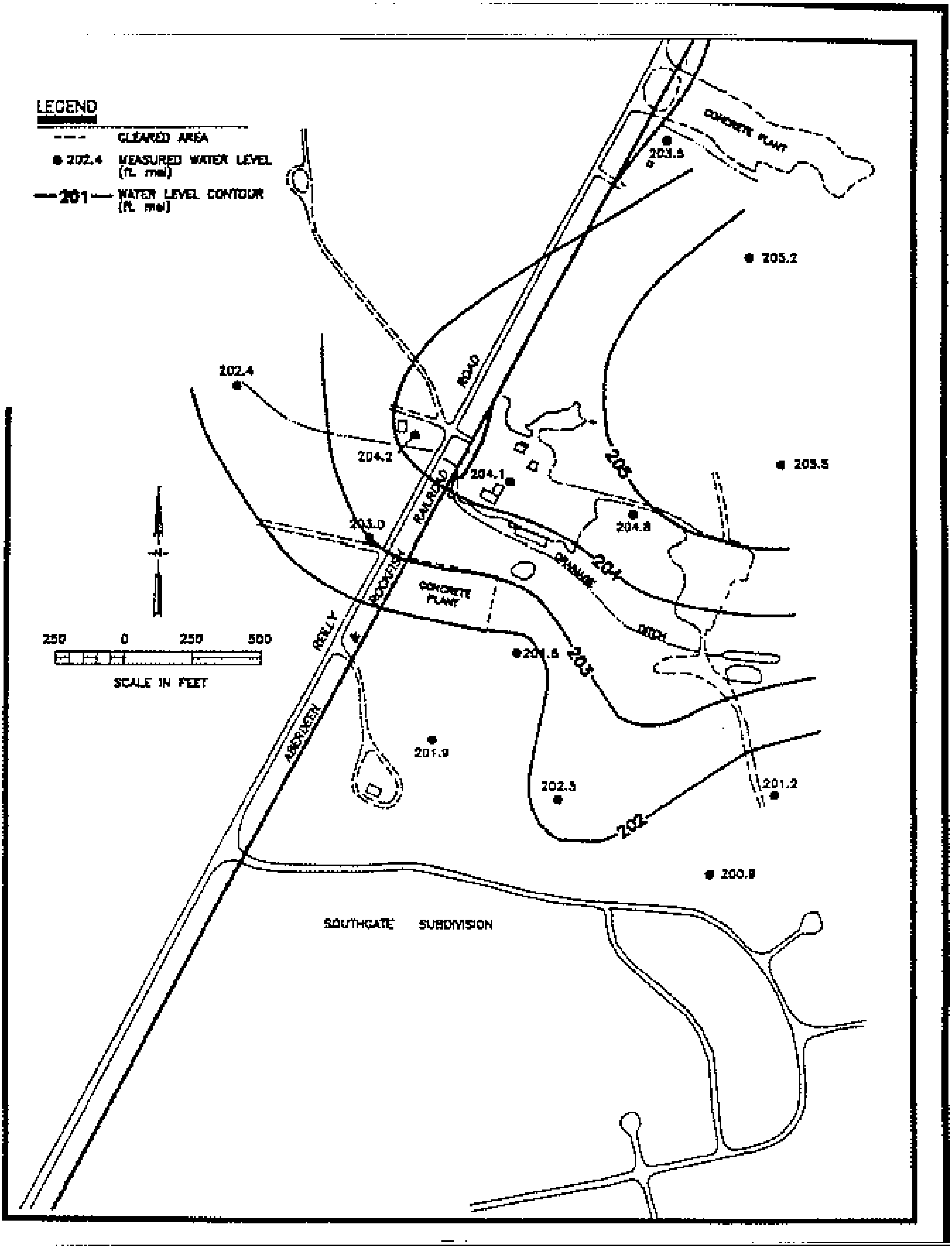
- The site is located at a topographic high point for the area and

- Sandy materials at the site facilitate higher rainfall recharge than in the surrounding areas.

The southwestward flow pattern in the lower aquifer is probably in response to the regional flow pattern for this aquifer.

The average horizontal groundwater velocity (based on Darcey's Law for groundwater flow) in the upper aquifer is approximately 9 feet/year and for the lower aquifer, 16 feet/year. Therefore, in 35 years (the time since the beginning of plant operations), the maximum contaminant migration in the upper aquifer would be expected to be in the order of 300 to 400 feet from the source and 500 to 600 feet in the lower aquifer. The analytical data base supports this determination.

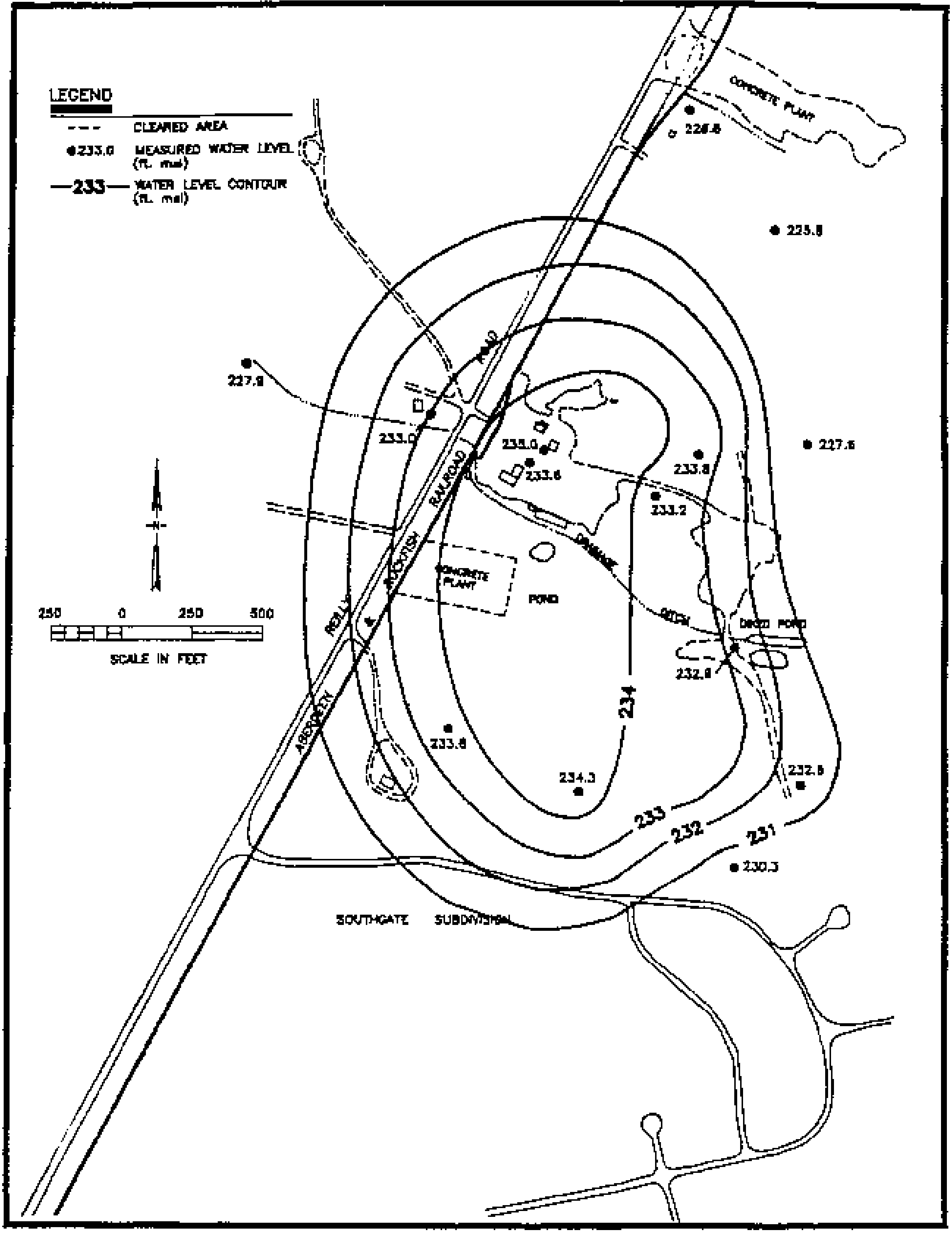
The average vertical groundwater velocity from the upper aquifer to the lower aquifer is estimated to be 3.0 feet/year.



LOWER AQUIFER WATER ELEVATIONS – 5/16/88

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 4



UPPER AQUIFER WATER ELEVATIONS - 5/16/88	FIGURE NO. 5
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	

Both aquifers underlying the site have been classified as Class IIA using U.S. EPA Groundwater Classification Guidelines of December 1986.

3.2 SITE CONTAMINATION

Remedial Investigation field work centered on the developed area of the site, the swampy areas northeast and southwest of the developed area, the clearing east of the developed area, and the drainage ditch and diked pond. Soil, groundwater, surface water and sediment samples were collected in and around these areas. The soil samples analyzed in the on-site laboratory provided sufficient data to determine horizontal extent of contamination. The other environmental samples (water and sediment) and 25% of the soil samples, were sent to a laboratory in the Contract Laboratory Program (CLP) and analyzed for the compounds on the Target Compound List (TCL). Five groundwater samples analyzed for hexavalent chromium (Cr^{+6}) and four soil samples were analyzed for dioxins.

The major contaminants are the organic compounds (polycyclic aromatic hydrocarbons - PAHs) grouped under the general term of coal-tar based creosote and the metals - copper, chromium and arsenic.

3.3 AIR CONTAMINATION

The most common sources of air contamination at hazardous waste sites are the volatilization of toxic organic chemicals and the spread of airborne contaminated dust particles. During the RI, site personnel used the HNu photoionization analyzer to monitor the air while performing the designated RI tasks. No airborne problems were encountered.

3.4 SOIL CONTAMINATION

The concentrations of contaminants detected in soil at the site are summarized in Table 1. This table provides the frequency of detection, the ranges of concentrations found in surficial soil at the site, and the background concentration ranges for those contaminants identified as chemicals of potential concern in Section 2.0 of the Risk Assessment (Appendix C of the FS). Dioxins were not detected in any of the four soil samples analyzed for this group of compounds.

Analyses of the soil samples indicate that in spite of previous removal actions, areas with high concentrations of inorganic chemicals and PAHs still remain. In general the most contaminated areas are in the process area, the northeast seasonal swamp, along the access road to the back storage area, and along the drainage ditch southeast of the process site.

TABLE 1

SURFICIAL SOIL SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	Frequency of Detection (%)	Concentration Range	Background Concentration Range*
Inorganic Chemicals (mg/kg)			
Aluminum	99	ND-14000	1600-2900
Arsenic	68	ND-15000	ND
Barium	52	ND-110	ND-21
Chromium	68	ND-1300	2.6-5.2
Copper	69	ND-6100	ND-11
Iron	100	99-15000	1500-2400
Lead	39	ND-270	ND-70
Magnesium	62	ND-530	ND-210
Organic Chemicals (ug/kg)			
Benzene	6	ND-71	ND
Toluene	29	ND-1100	ND-390
PAHs (mg/kg)			
Acenaphthene	12	ND-1300	ND
Acenaphthylene	16	ND-244	ND
Anthracene	20	ND-24000	ND
Benzo(a)anthracene	12	ND-370	ND-0.072
Benzo(b and/or k)fluoranthene	26	ND-560	ND-0.20
Benzo(g,h,i)perylene	12	ND-13	ND-0.038
Benzo(a)pyrene	17	ND-180	ND-0.085
Chrysene	20	ND-630	ND-0.090
Dibenzo(a,h)anthracene	5	ND-7.8	ND
Fluoranthene	27	ND-2600	ND-0.16
Fluorene	18	ND-4100	ND
Indeno(1,2,3-cd)pyrene	12	ND-18	ND-0.047
Naphthalene	11	ND-390	ND
Phenanthrene	15	ND-8100	ND-0.039
Pyrene	29	ND-2200	ND-0.16
Total PAHs	53	ND-37000	ND-0.89

ND = Not detected
* = Based on the analytical results for the three background surficial soil samples (BCK-1, BCK-2, and BCK-3).

Figures 6 through 10 show the surficial soil analytical results for chromium, arsenic, total PAHs, benzene, and toluene, respectively. These chemicals were used extensively in past wood preserving operations at the site and therefore, are good indicators of the extent of site-related soil contamination. Figures 6 through 10 also show areas of high and moderate contamination compared to background levels.

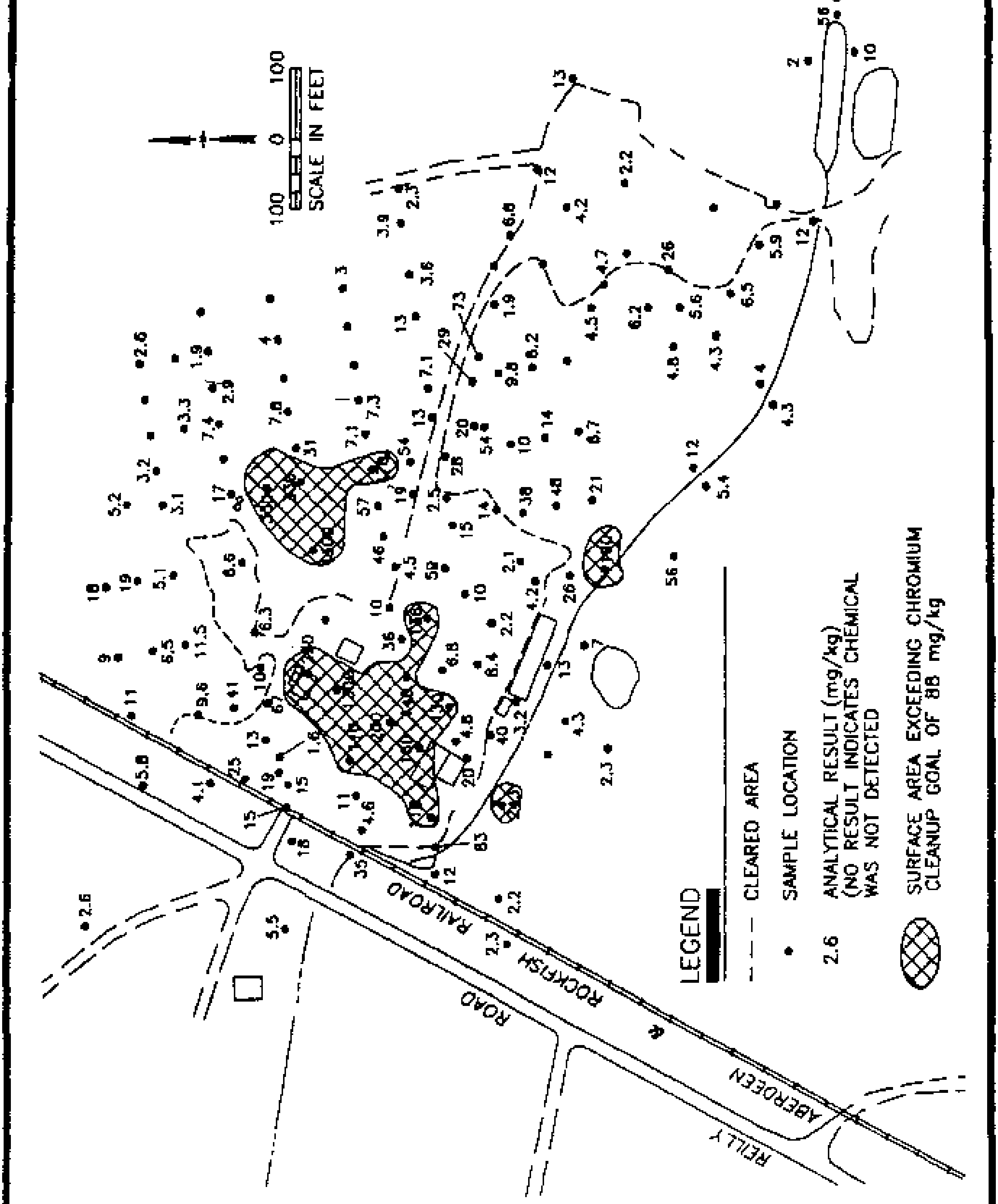
As shown in Figures 6 through 7, chromium and arsenic metal contamination is found mainly in the central process area and in the northeast seasonal swamp. Significantly elevated concentrations were also found along the access road and drainage ditch. The highest concentrations of chromium and arsenic (1300 and 15,000 mg/kg, respectively) were all found at grid point C-5 which is just south of the creosote unit.

PAHs are mainly concentrated in the western process area as shown in Figure 8. Isolated occurrences of high concentration were also found along the access road and the drainage ditch. The western process area was historically used to unload the creosote from the railroad cars which may explain the high concentrations of PAHs found in this area. The highest concentration of total PAHs (37,000 mg/kg) was found at SS-2 near the railroad. The second highest concentration of total PAHs (11,000 mg/kg) was found at grid point D-9 which is located in the bed of the drainage ditch. This sample is essentially a sediment sample, but was taken when the ditch was dry.

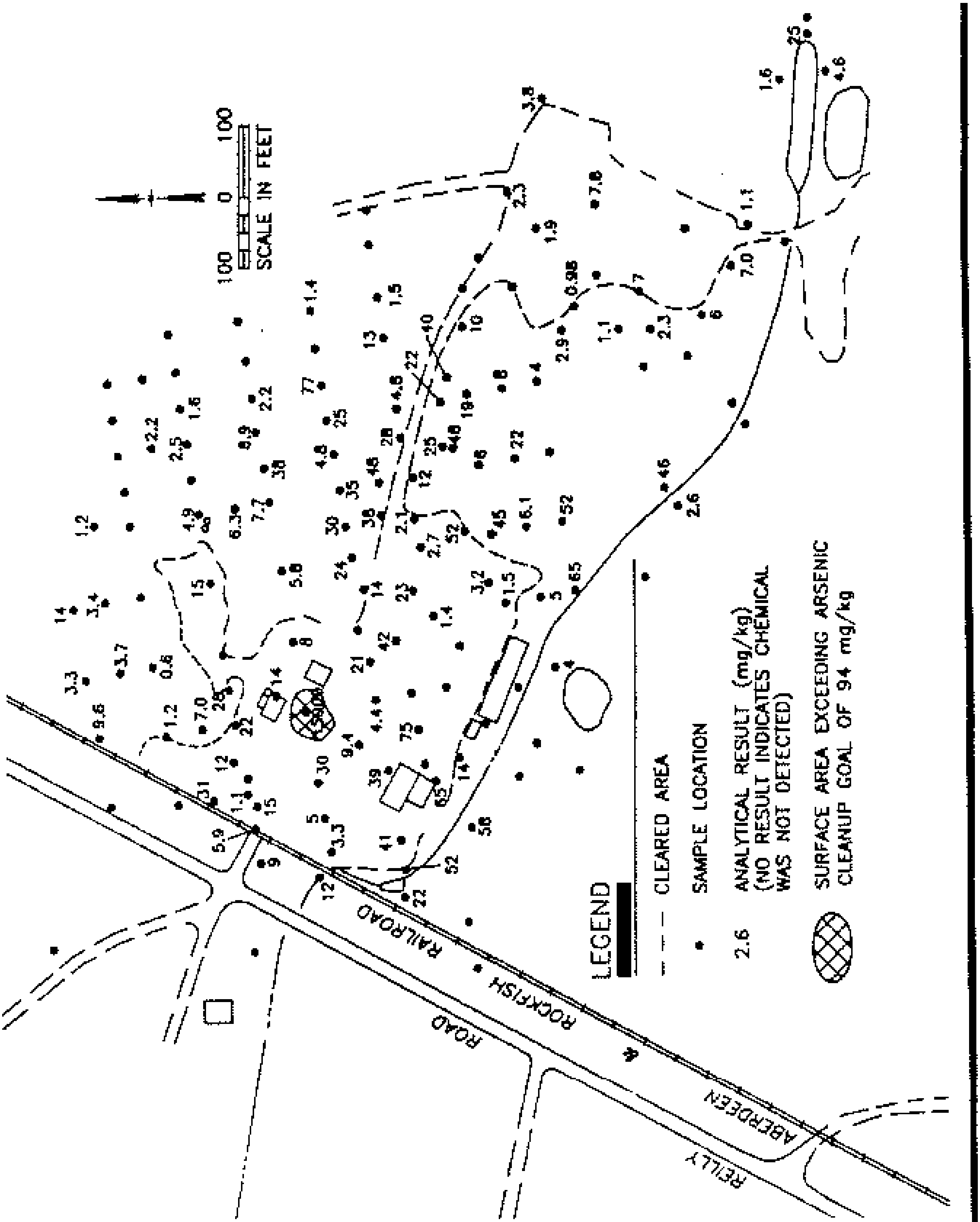
Results of the benzene and toluene analyses shown in Figures 9 and 10, respectively, indicate that volatile organics are not as widespread at the site as the inorganics and PAHs, but they are still prevalent. Of the two, toluene is by far the more prevalent. Toluene is concentrated mainly in the central process area and in the northeast seasonal swamp. The highest concentration of toluene (1100 mg/kg) was found at grid point C-5 which is just south of the creosote unit. Benzene is concentrated mainly in the southern process area with the highest concentration (71 mg/kg) found at grid point D-8 which is just east of the metal shed. It is believed that the source of the benzene contamination is the underground gasoline storage tank buried at the west end of the metal shed.

A comparison of the indicator chemical analytical results for soil samples collected at the surface and at depth (5 feet) is provided in Table 2. As shown, the majority of contamination is found at the surface, particularly around the perimeter of the contaminated area. Therefore, a sloping contaminated soil interface does not appear to be prevalent and the results of the surficial soil sampling program provide a valid determination of the horizontal extent of contamination.

A composite of these areal extents is provided in Figure 11, which shows surface soil locations exceeding the cleanup goals for all contaminants of concern. This area encompasses approximately 150,000 square feet (3.4. acres).



CHROMIUM CONCENTRATIONS EXCEEDING CLEANUP GOAL IN SURFICIAL SOILS	FIGURE NO.
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	6

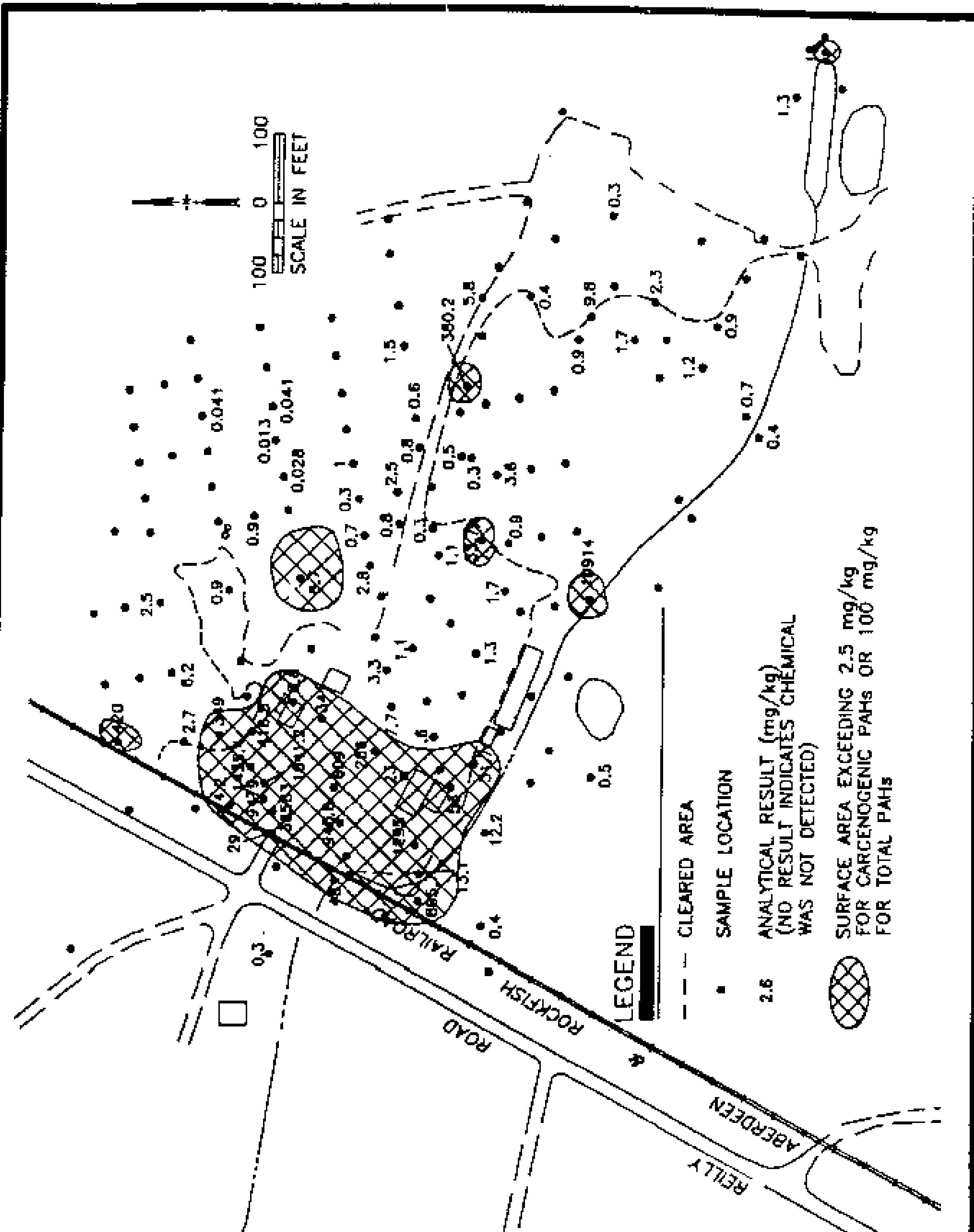


ARSENIC CONCENTRATIONS EXCEEDING CLEANUP GOAL IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 7



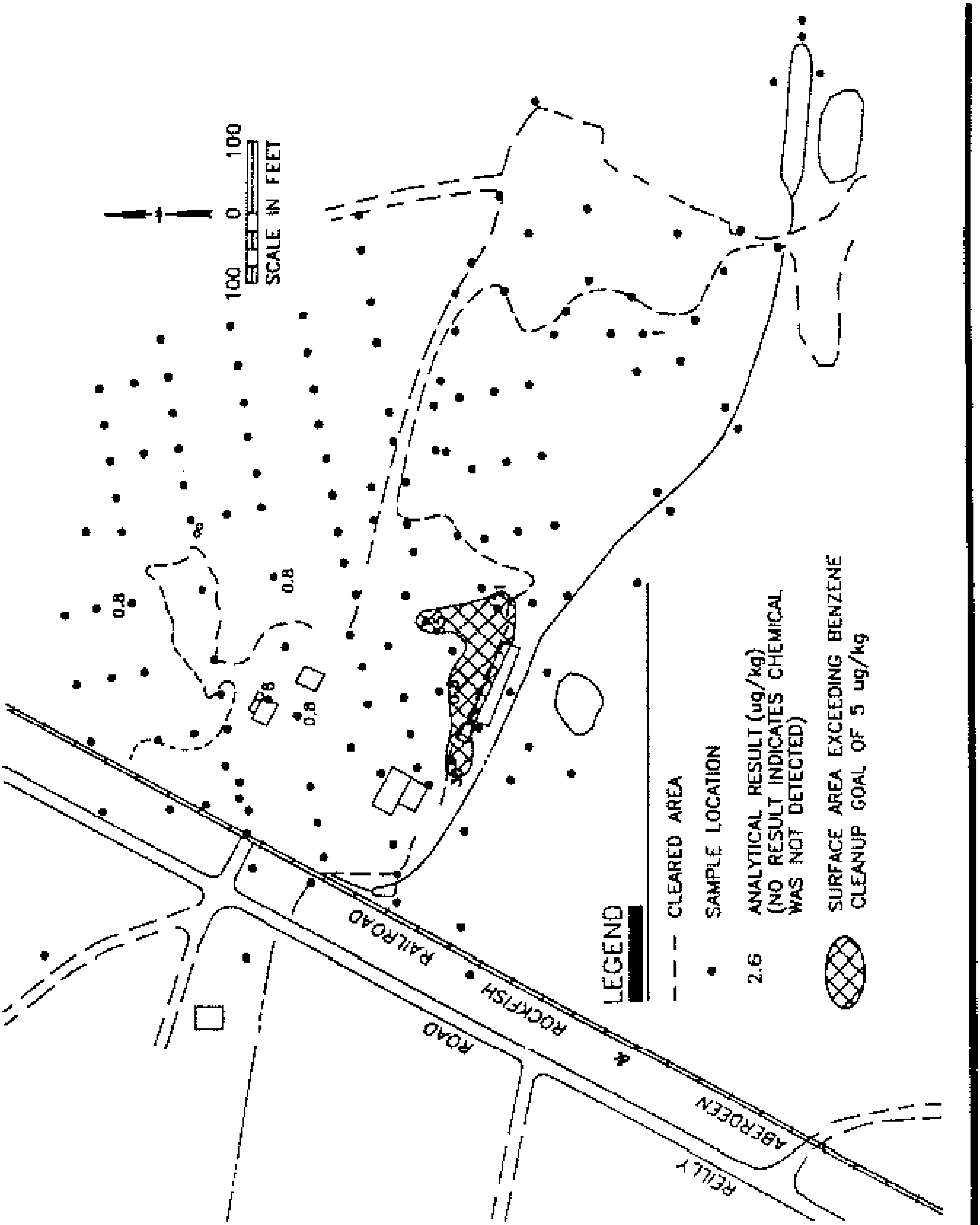
PAH CONCENTRATIONS EXCEEDING CLEANUP GOALS IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.

8

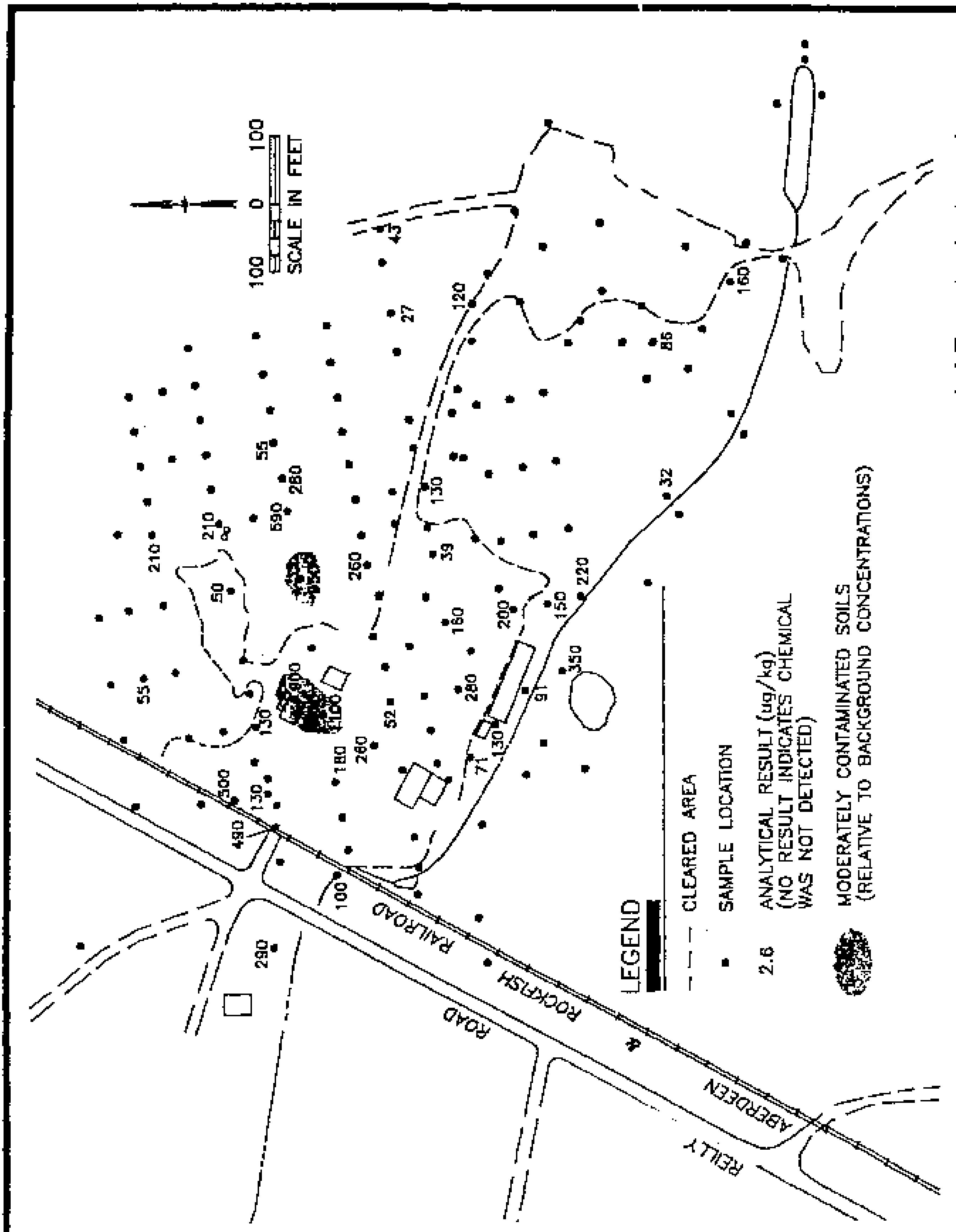


BENZENE CONCENTRATIONS EXCEEDING CLEANUP GOAL IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 9



TOLUENE CONCENTRATIONS IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 10

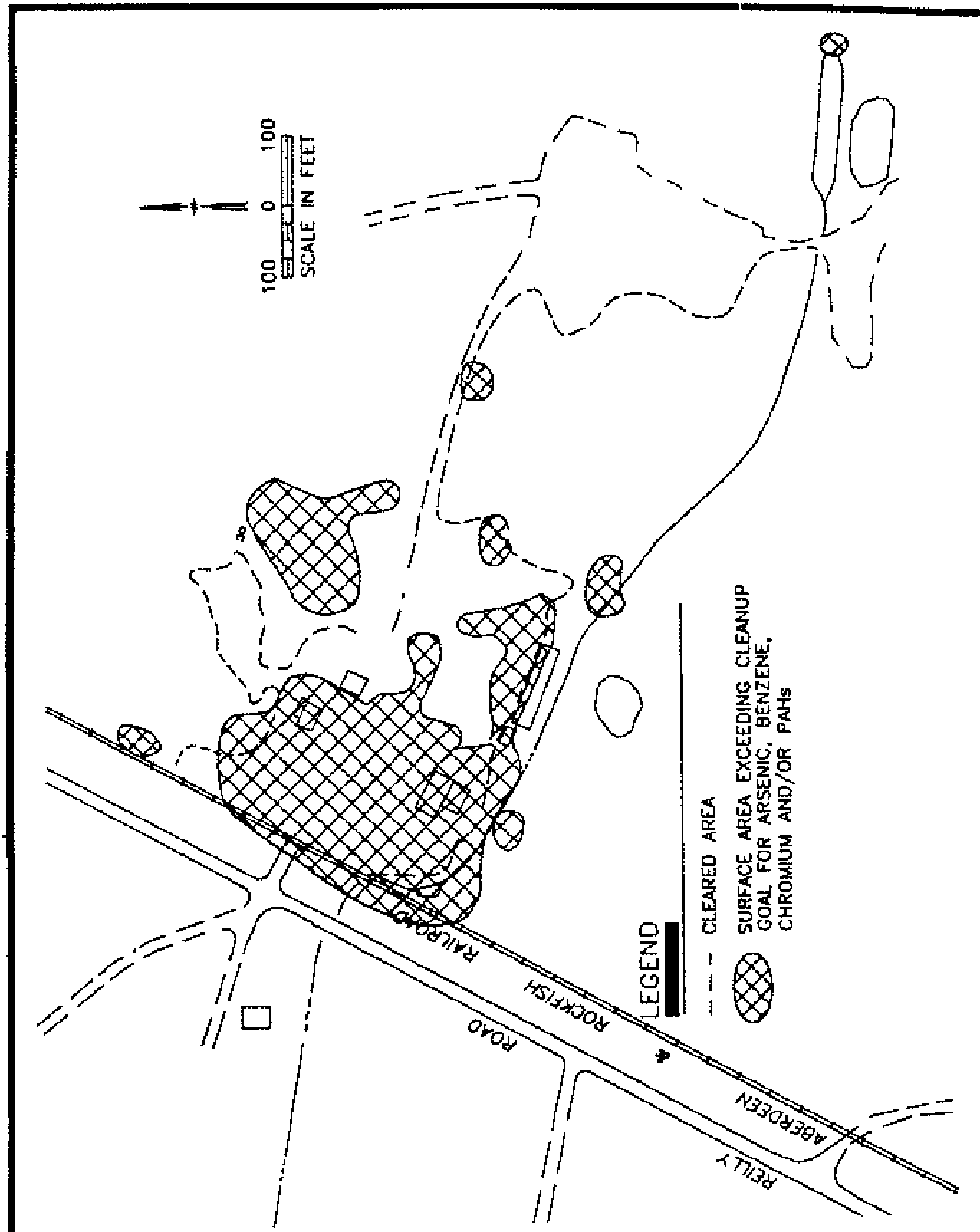


FIGURE 11

HORIZONTAL EXTENT OF CONTAMINATION EXCEEDING CLEANUP GOALS IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

TABLE 2

COMPARISON OF 1-FOOT AND 5-FOOT SOIL SAMPLE RESULTS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene ug/kg)
AA8-01	1	2.3	2.3	-	-	-	-
AA8-05	5	2.4	-	-	0.5	-	-
A4-01	1	18	4.8	9	-	-	-
A4-05	5	-	-	-	0.3	-	-
A6-01	1	110	27	41	1300	-	-
A6-05	5	8.6	-	-	1.6	-	-
A7-01	1	240	78	58	12	-	-
A7-05	5	120	32	54	0.52	-	-
B3-01	1	4.1	3.3	-	-	-	-
B3-05	5	7.1	-	-	2.0	-	-
B4-01	1	19	3.6	7.9	9500	130	-
B4-05	5	12	-	-	210	150	-
C2-01	1	11	4.8	9.6	420	-	-
C2-05	5	8.7	2.2	-	130	-	-
C4-01	1	67	13	22	420	130	-
C4-05	5	6.4	-	-	1000	-	-
C8-01	1	13	15	-	-	87	-
C8-05	5	-	-	-	-	-	-
D10-01	1	22	-	-	-	-	-
D10-05	5	-	-	-	-	-	-
E2-01	1	18	8	14	-	-	-
E2-05	5	7.1	2.4	-	-	-	-
G5-01	1	7.8	6.8	8.9	0.013	55	-
G5-05	5	4.5	-	-	-	-	-
SS3-01	1	230	20	130	8.6	900	8
SS3-05	5	240	6.5	180	2.3	-	-

TABLE 2
(Continued)

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
SS15-01	1	4.5	-	2.9	0.9	-	-
SS15-05	5	3.2	-	-	0.3	-	-
SS28-01	1	1.9	23	10	-	-	-
SS28-05	5	2.4	-	-	0.4	-	-
EXT21-01	1	5.2	-	1.2	-	-	-
EXT21-05	5	-	-	0.5	-	-	-
EXT22-01	1	3.2	-	-	-	-	-
EXT22-05	5	-	-	-	-	-	-
EXT27-01	1	9	8.8	77	-	4	-
EXT27-05	5	-	-	-	-	-	-
EXT29-01	1	3.6	6.4	1.5	-	27	-
EXT29-05	5	4.2	2.1	-	-	-	-
EXT31-01	1	8.2	7.7	8	-	-	-
EXT31-05	5	2.3	-	-	2.0	-	-
EXT34-01	1	26	7.7	5	-	150	-
EXT34-05	5	-	-	-	-	-	-
EXT41-01	1	-	-	-	-	-	-
EXT41-05	5	-	-	-	-	-	-
DD9-01	1	56	4.3	25	1.3	230	-
DD9-05	5	20	2.5	21	0.50	-	-

- = Not Detected

Results of the vertical extent of contamination analyses (borehole samples - Figure 12) indicate that although the surface is highly contaminated in several areas, the subsurface below two feet is generally uncontaminated. Indicator chemical analytical results for the borehole samples, including the background borehole, are provided in Table 3. The only significant contamination above background at depth is the PAH contamination found in BH-1 and BH-2. Moderate concentrations of PAHs were found down to a depth of approximately 23 feet in BH-1 and 46 feet in BH-2. BH-1 is located in the area of the creosote unloading zone, and BH-2 is located in the area of the creosote unit.

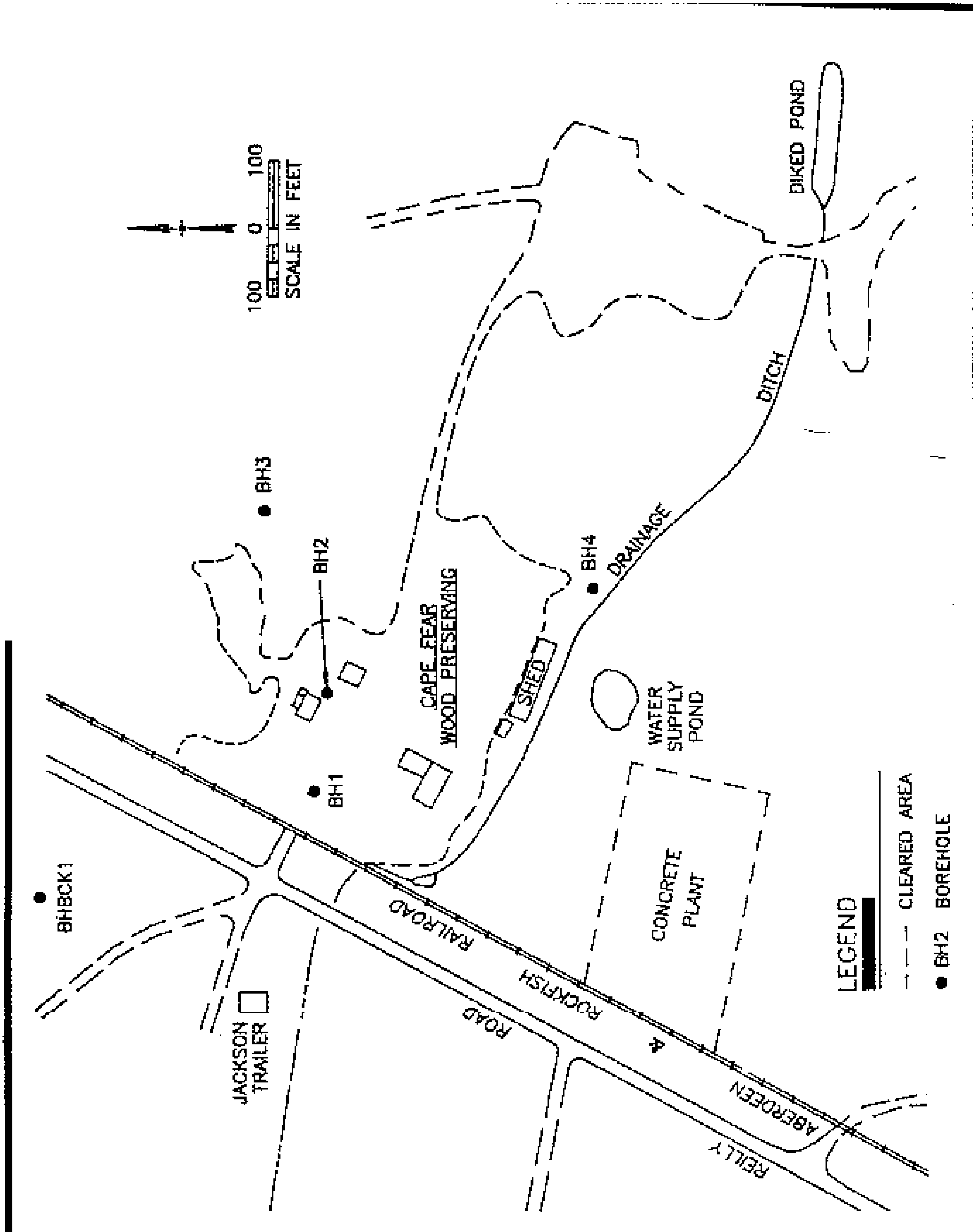
Since contaminated soils from the site were land farmed on property owned by Grace Parker, samples were collected here to insure that a health risk did not exist due these past disposal actions. The Grace Parker property analytical results for the chemicals of potential concern are shown in Table 4. As shown, the Grace Parker property has been contaminated with low levels of PAHs.

3.5 GROUNDWATER CONTAMINATION

Figure 13 locates the installed monitoring wells that provided the groundwater samples and Table 5 summarizes the concentrations of contaminants detected in groundwater that were identified as chemicals of potential concern in the Risk Assessment (Appendix C, Section 2.0 of the FS document). The complete analytical results can be seen in Appendix A of the RI Report.

In general, analyses of the groundwater samples indicate low-level contamination by a variety of inorganic and organic chemicals including several PAHs. The organic chemicals, however, are the only chemicals which indicate any kind of plume pattern or area of contamination which can be tied to the site. The inorganic chemicals do not show any kind of pattern and in most cases, higher concentrations are found off-site than on-site.

Figures 14 through 17 show the analytical results of total PAHs and total BTXs (benzene, toluene and xylene) in both the upper and lower aquifers. These contaminants are known to be site-related and for the most part are not naturally occurring and therefore, are good indicators of site induced contamination. In addition, because BTXs do not generally become tied up in the soil matrix, they are good indicators of the maximum extent of contamination. As can be seen in Figures 14 through 17, contaminant plumes have been identified in both aquifers based on the analytical results. The plume in the upper aquifer extends a few hundred feet in all directions around the wood preserving process area. The plume in the lower aquifer covers only a small portion of the process area and is located around well EW-01. The plume in this aquifer could be the result of contaminants migrating through the semi-confining unit, but is more likely due to poor construction of well EW-01 (an old industrial water supply well) providing the conduit for migration. Well EW-01 is screened in the lower part of the lower aquifer. If contaminants were migrating through the semi-confining unit to the depth of EW-01, a greater extent of contamination would be



BOREHOLE SAMPLING LOCATIONS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 12

TABLE 3

BOREHOLE SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
BH1-S12	1	-	5	0.58	-	-	-
S13	3	12	-	-	0.6	-	-
S1	5	5.8	-	-	7.5	-	-
S2	7	5.4	-	-	0.3	-	-
S3	9	24	10	18	2.0	8	4
S4	11	12	-	-	280	-	-
S5	13	12	-	-	1.4	-	-
S6	15	10	-	-	0.3	-	-
S7	17	38	-	-	1.1	-	-
S8	19	8.5	-	-	0.7	-	-
S9	21	28	-	-	-	-	-
S10	23	14	-	-	8.2	-	-
S11	25	7.5	-	-	-	-	-
S14	31	27	-	-	-	-	-
S15	36	30	-	-	-	-	-
S16	41	10	-	-	-	-	-
S17	46	-	-	0.8	1.2	-	-
S18	51	10	2.6	0.6	-	-	-
S19	56	7.2	2.8	0.92	-	-	-
S20	61	-	2.4	-	-	-	-
S21	66	-	2.5	-	-	-	-
BH2-S1	1	214	32	16	0.3	-	-
S2	3	9.8	-	-	-	-	-
S3	5	8.2	2.3	-	-	-	-
S4	7	13	2.6	-	210	-	-
S5	9	11	2.8	-	670	-	-
S6	11	8.4	-	-	22	-	-
S7	13	4.2	7	2	4.0	-	-
S8	15	5.2	-	-	0.5	-	-
S9	17	9	-	-	6.9	300	17
S10	19	5.4	-	-	2.1	-	-
S11	26	25	-	-	20.1	-	-
S12	31	20	2.4	-	6.5	-	-
S13	36	8.5	2.6	-	0.7	-	-
S14	41	6.9	2.7	-	13.6	-	-
S15	46	9.6	8.2	4.7	8.2	70	-
S16	51	5.5	23	-	0.096	-	-

TABLE 3
(Continued)

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
S17	56	6.8	11	-	-	-	-
S18	61	-	2.6	-	-	-	-
S19	66	-	10	-	-	-	-
BH3-S1	1	-	-	1.1	-	-	-
S2	3	5.2	-	0.68	-	-	-
S3	5	-	-	0.62	0.6	-	-
S4	7	14	2.5	7.7	-	36	-
S5	9	16	2.9	0.55	-	-	-
S6	11	15	-	0.75	0.3	-	-
S7	13	13	-	-	-	-	-
S8	15	13	-	0.58	-	-	-
S9	17	12	-	-	0.3	-	-
S10	19	10	-	-	0.8	-	-
S11	24	-	-	-	-	-	-
S12	29	17	2.3	-	-	10	-
S13	31	32	-	-	-	-	-
S14	33	6.5	-	-	-	-	-
S15	35	-	-	-	-	-	-
S16	39	8.9	-	-	-	-	-
S17	44	4.6	2.9	-	-	-	-
S18	49	-	-	2.5	0.3	-	-
S19	54	4.8	2.6	-	0.3	-	-
S20	59	7.6	8.8	1.8	-	-	-
BH4-S2	3	-	-	1.4	-	-	-
S3	5	6	-	-	-	-	-
S4	7	6.8	2.8	-	-	-	-
S5	9	6.3	-	-	1.8	-	-
S6	11	-	-	-	-	-	-
S7	13	-	-	-	-	-	-
S8	15	-	-	-	-	-	-
S9	17	-	-	-	0.3	-	-
S10	19	-	-	-	-	-	-
S11	21	-	-	-	-	-	-
S12	23	-	-	-	-	-	-
S13	25	-	-	-	NA	-	-
S15	29	-	-	-	NA	-	-
S16	36	20	2.9	-	NA	-	-
S17	41	-	-	-	NA	-	-
S18	46	5.4	-	-	NA	-	-
S19	51	10	-	-	NA	-	-

Table 3
(Continued)

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
S20	56	15	3.1	4.2	-	25	-
S21	61	2.8	-	-	-	-	-
BHBCK1-S1	1	11	-	9.1	-	6	-
S3	5	-	-	-	-	-	-
S5	9	-	-	-	-	-	-
S8	15	4.9	-	-	-	110	-
S11	21	17	-	-	-	-	-
S13	25	5.5	-	-	-	38	-
S17	33	88	3	1.6	-	66	-
S20	39	-	-	-	-	-	-
S23	45	9.6	-	8.5	-	12	-
S24	47	-	-	0.7	-	-	-
S30	59	2.8	-	-	-	-	-

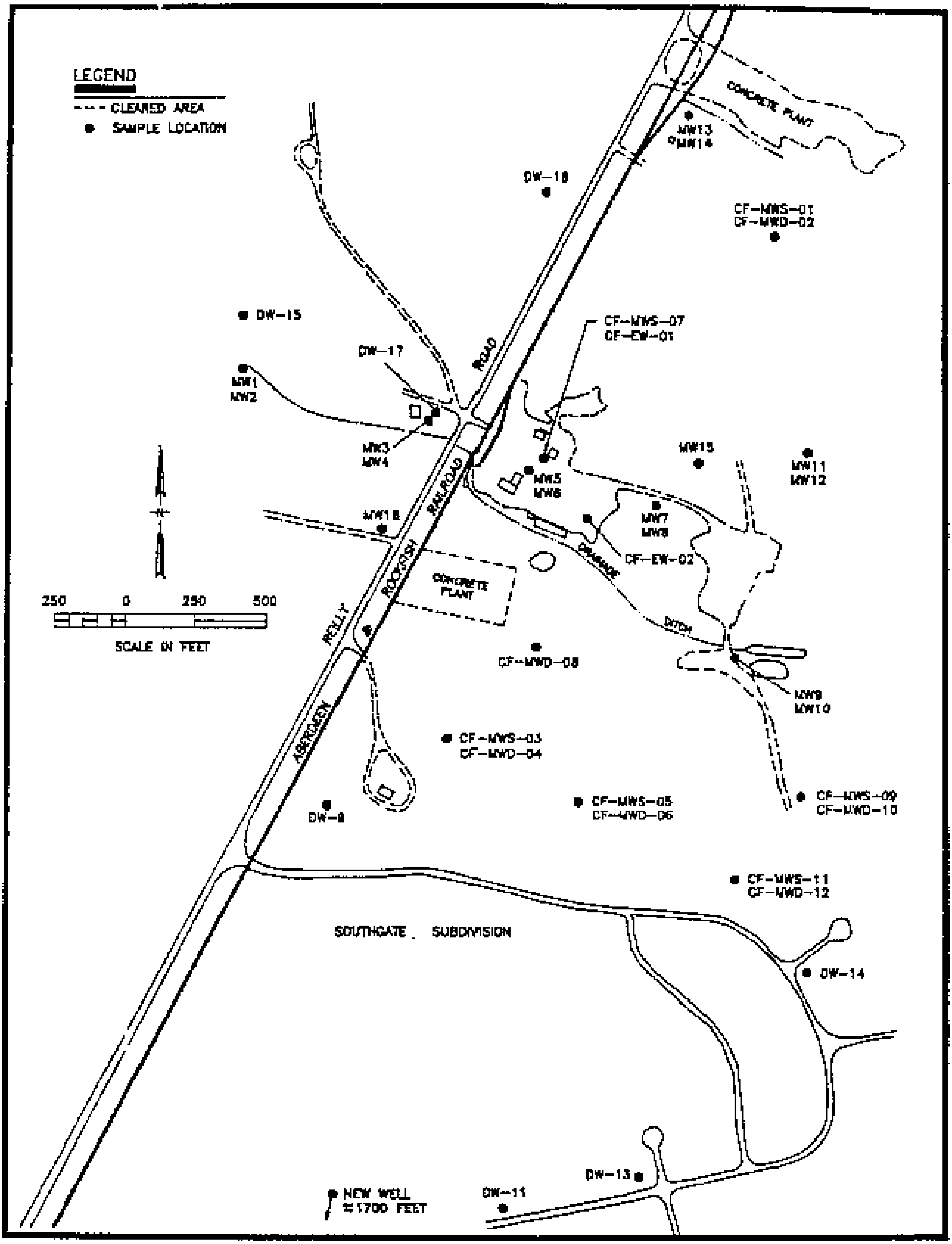
\- = Not detected
NA = Not analyzed

TABLE 4

GRACE PARKER PROPERTY SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	GP-l	GP-2	GP-3	GP-4
Inorganic Chemicals (mg/kg)				
Aluminum	2100	NA	NA	NA
Arsenic	-	-	-	-
Barium	8.5	NA	NA	NA
Chromium	4.1	-	2.2	2.1
Coppe	2	6	4.4	6.3
Iron	1400	NA	NA	NA
Lead	-	NA	NA	NA
Magnesium	250	NA	NA	NA
Organic Chemicals (ug/kg)				
Benzene	-	-	53	-
Toluene	150	-	-	-
PAHs (mg/kg)				
Acenaphthene	-	-	-	-
Acenaphthylene	0.042	-	-	-
Anthracene	0.10	-	-	-
Benzo (a) anthracene	0.14	-	-	-
Benzo (b and/or k) fluoranthene	1.3	-	-	1.1
Benzo (g,h,i) perylene	0.19	-	-	-
Benzo (a) pyrene	0.44	-	-	0.3
Chrysene	0.20	-	-	-
Dibenzo (a,h) anthracene	0.068	-	-	-
Fluoranthene	0.12	-	-	0.3
Fluorene	-	-	-	0.8
Indeno (1,2,3-cd) pyrene	.35	-	-	-
Naphthalene	-	-	-	-
Phenanthrene	-	-	-	-
Pyrene	0.20	-	-	1.8
Total PAHs	3.2	-	-	4.3

\- = Not detected
NA = Not analyzed



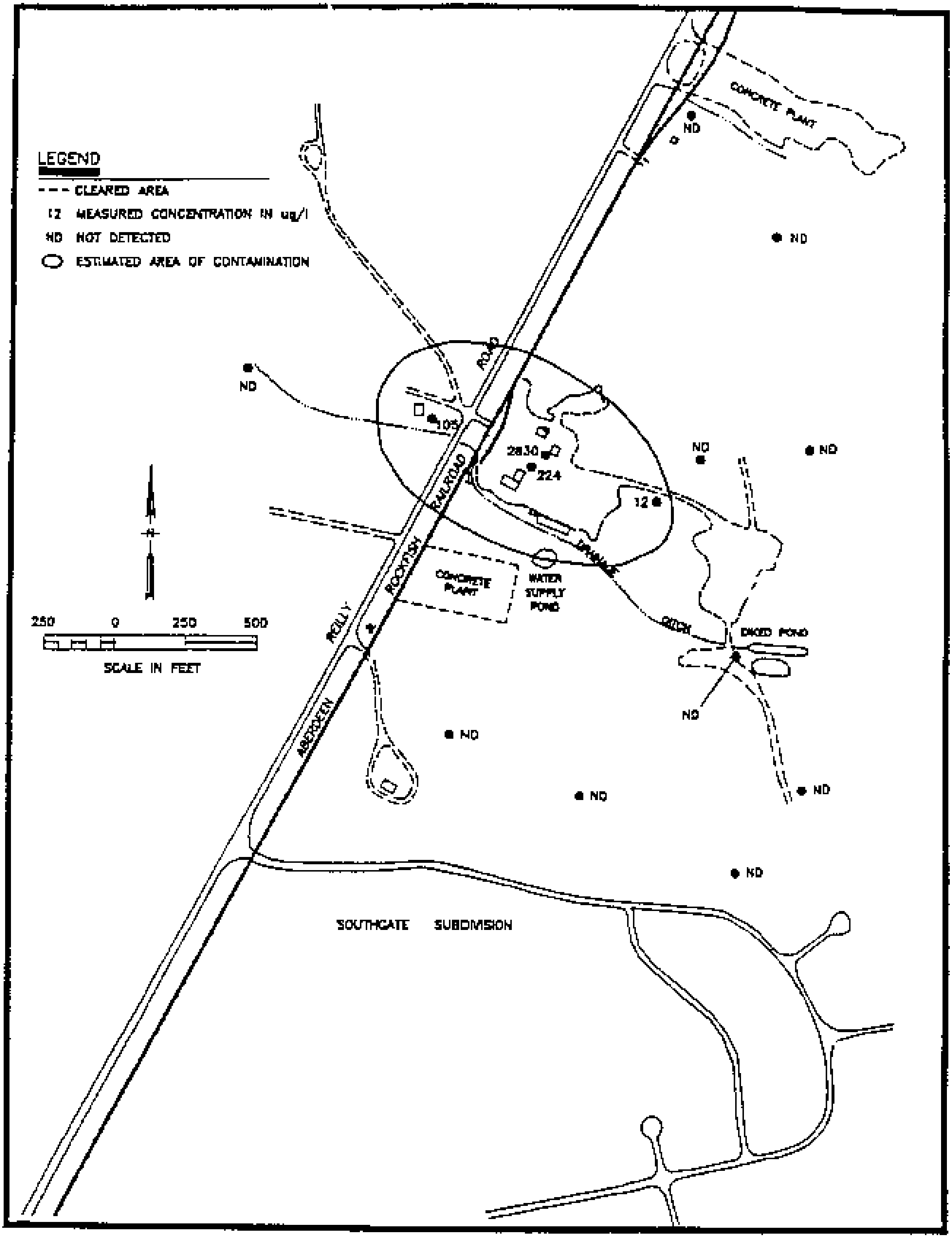
GROUND WATER SAMPLING LOCATIONS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.

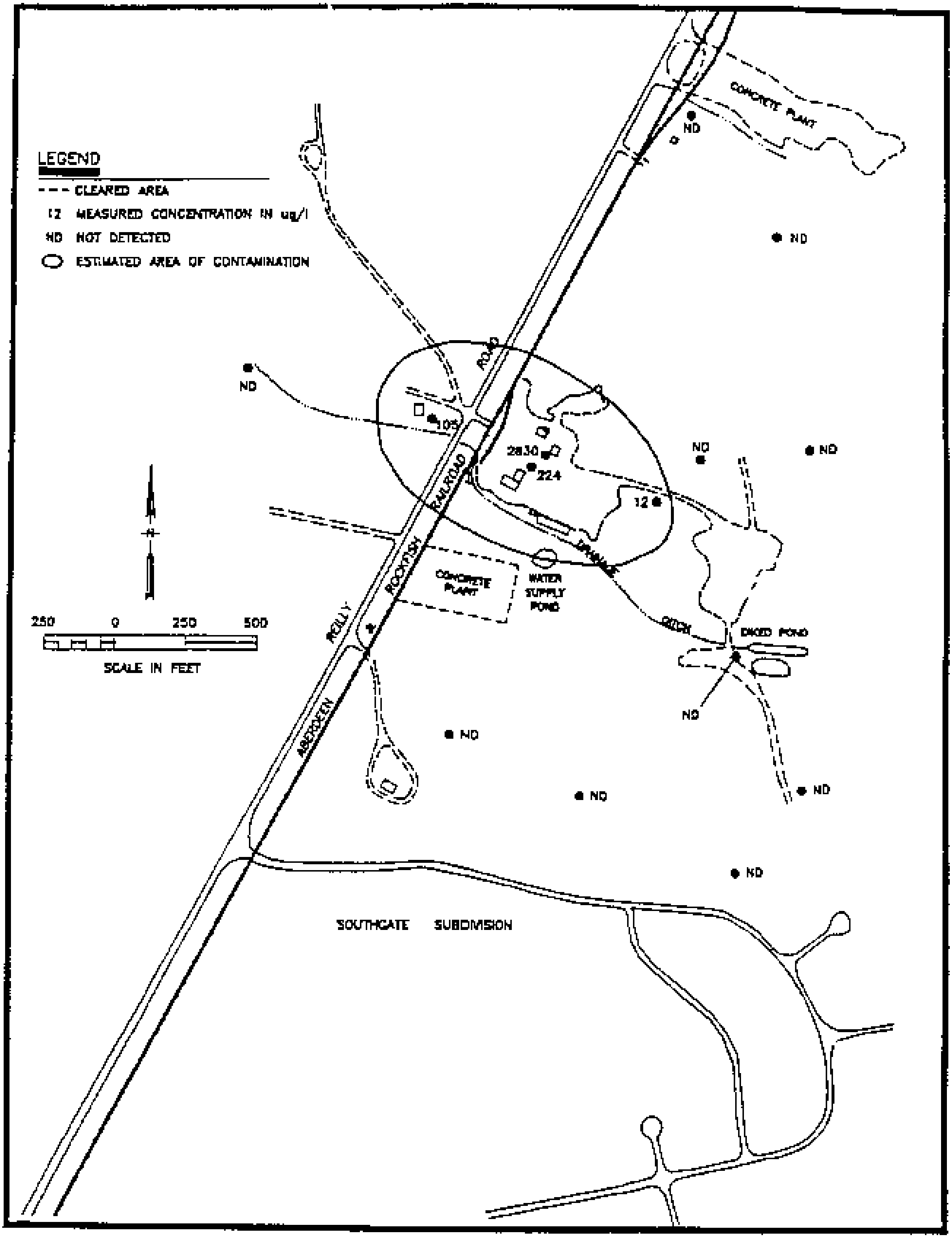
13



TOTAL BTX CONCENTRATIONS IN UPPER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

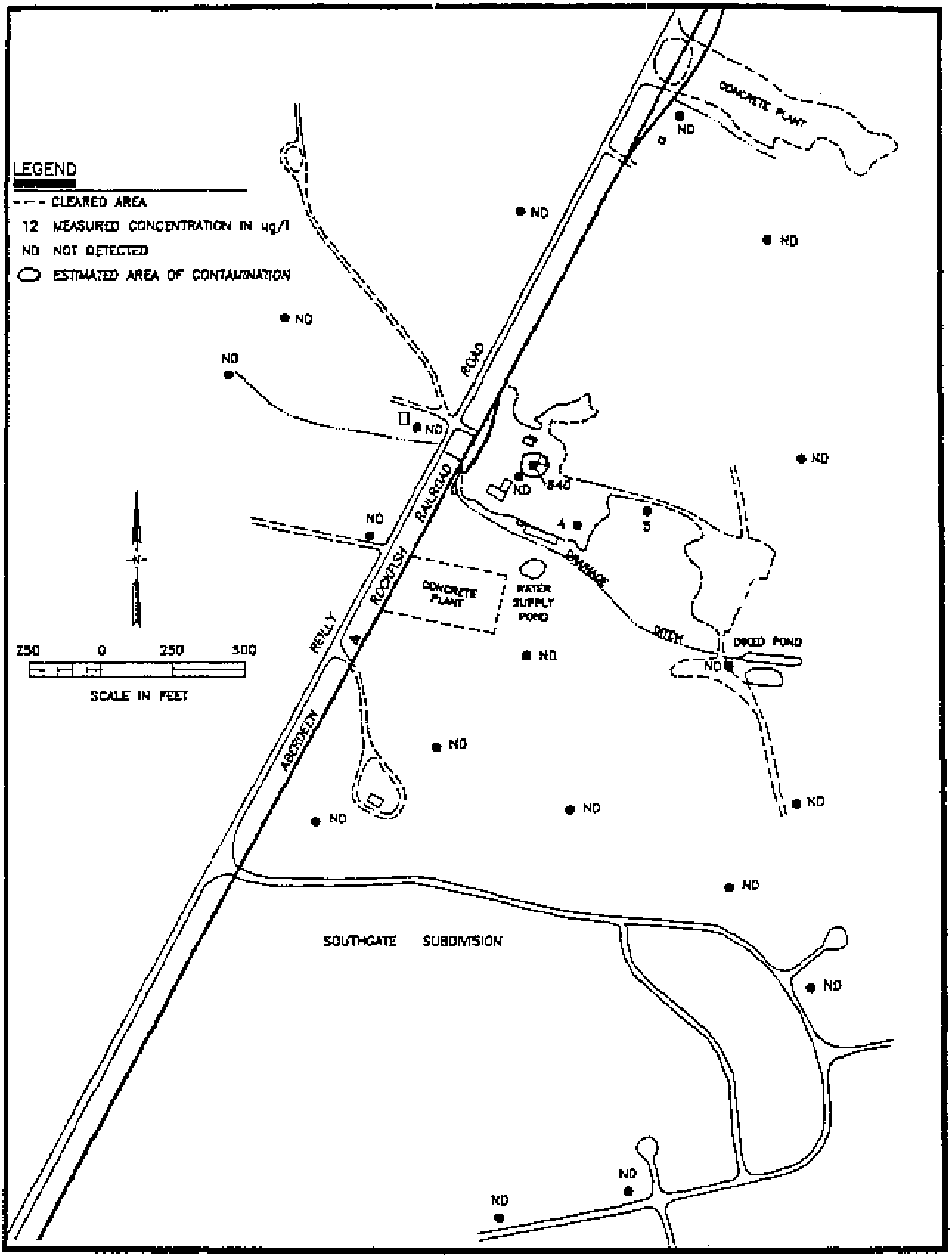
FIGURE NO.
15



TOTAL BTX CONCENTRATIONS IN UPPER AQUIFER

FIGURE NO. 15

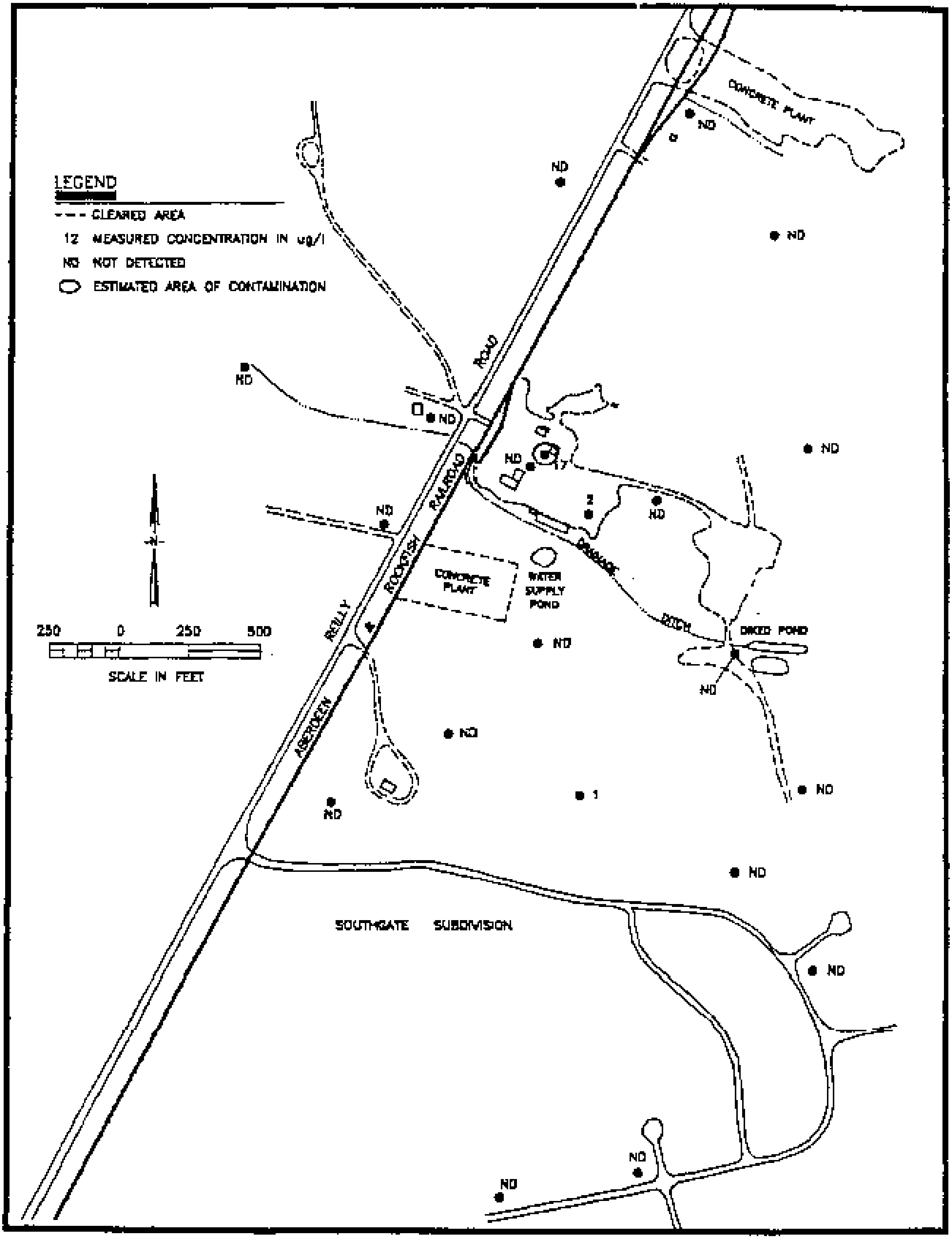
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA



TOTAL PAH CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.
16



TOTAL BTX CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.
17

expected in the groundwater, at least out to MW-6. Since MW-6 is located downgradient of EW-01 and in the middle of the processing area with the screen in the upper part of the lower aquifer, if contamination was migrating through the semi-confining layer, then it would be seen in MW-6.

The plume in the upper aquifer is consistent with the results of the hydrogeological analysis. The plume in the lower aquifer, however, is not consistent with the hydrogeologic analysis results. Contaminants do not appear to be migrating through the semi-confining unit into the lower aquifer indicating that contaminants are probably not moving vertically as groundwater moves. Retardation and/or decay processes in the upper aquifer and semi-confining unit have most likely kept the contaminants from entering the lower aquifer, to any significant degree.

Figures 18 through 21 show the analytical results for chromium and arsenic in both the upper and lower aquifers. These contaminants are also known to be site-related and therefore could be indicators of site induced contamination. As can be seen in Figures 18 through 21, however, the analytical results for these inorganic chemicals do not show any kind of plume pattern which can tie the inorganic contamination to the site.

The inorganic contamination found in the study area likely exists for one of two reasons:

- Naturally occurring conditions or

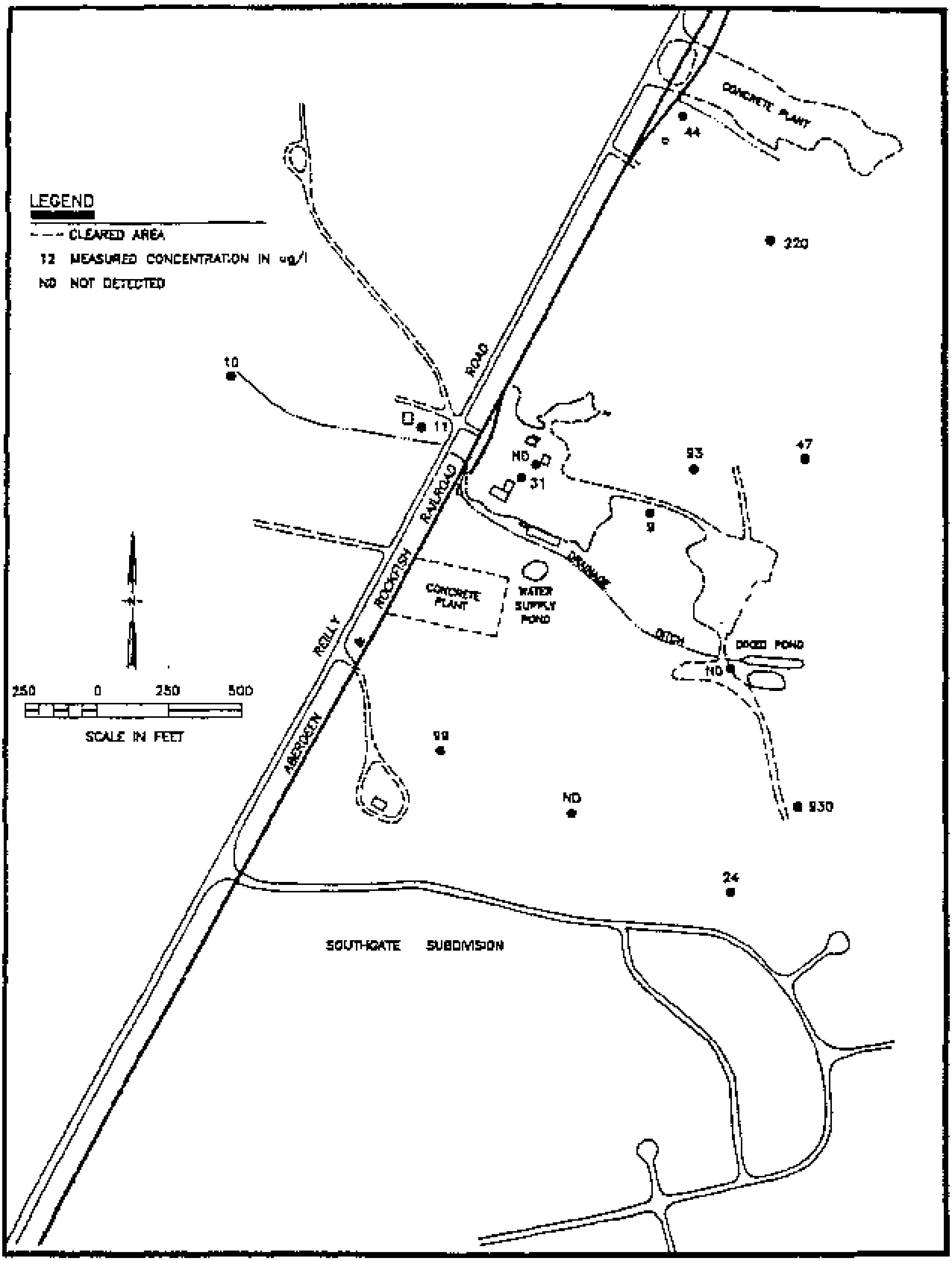
- Small, local sources of contamination.

All the inorganic chemicals listed in Table 5 are naturally occurring in the soils of the study area, and given the low pH of groundwater, most of the concentrations measured for these chemicals are probably within the natural variation of concentrations expected. This is especially true considering that the samples are not filtered before being analyzed. Three wells, however, appear to have an unusually high concentration of one particular element. These wells include MWS-1, MWS-9 and DW-14 which are far from the site. Both wells MWS-1 and MWS-9 have unusually high concentrations of chromium, while well DW-14 has an unusually high copper concentration. These wells have not exhibited any contamination in the past.

Of the five wells sampled and analyzed for hexavalent chromium (Cr^{+6}), only one showed evidence of Cr^{+6}. Well EW-02 had a concentration of 16 ug/l. The other four were below detection limits.

3.6 SURFACE WATER AND SEDIMENT

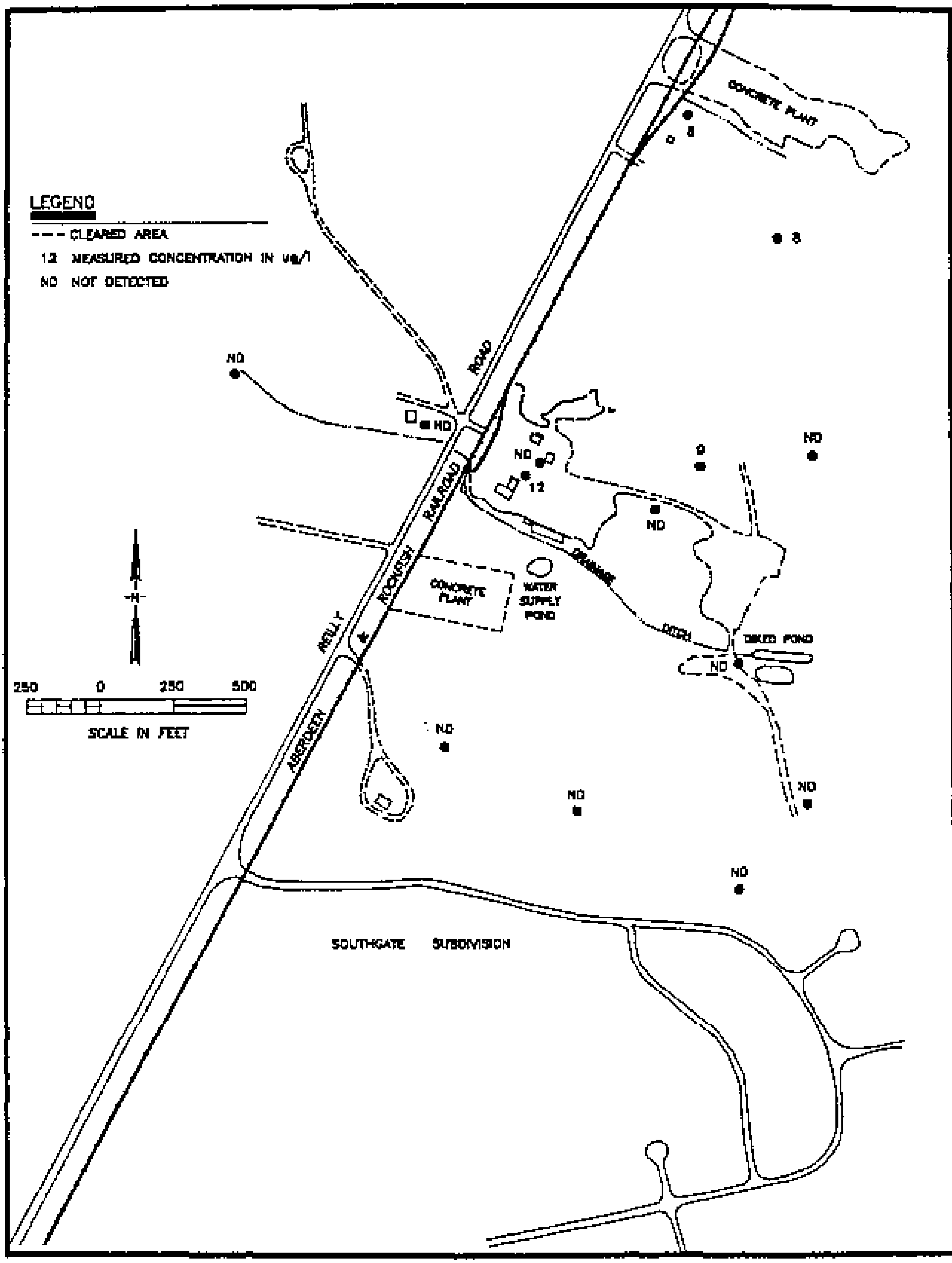
The concentrations of contaminants detected in surface water and sediment samples (sampling locations shown in Figure 22) are summarized in Tables 6 and 7, respectively. The tables present the analytical results for those chemicals identified as chemicals of potential concern in Section 2.0 of the Risk Assessment (Appendix C, Section 2.0 of the FS document). The complete analytical results can be seen in Appendix A of the RI Report).



CHROMIUM CONCENTRATIONS IN UPPER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

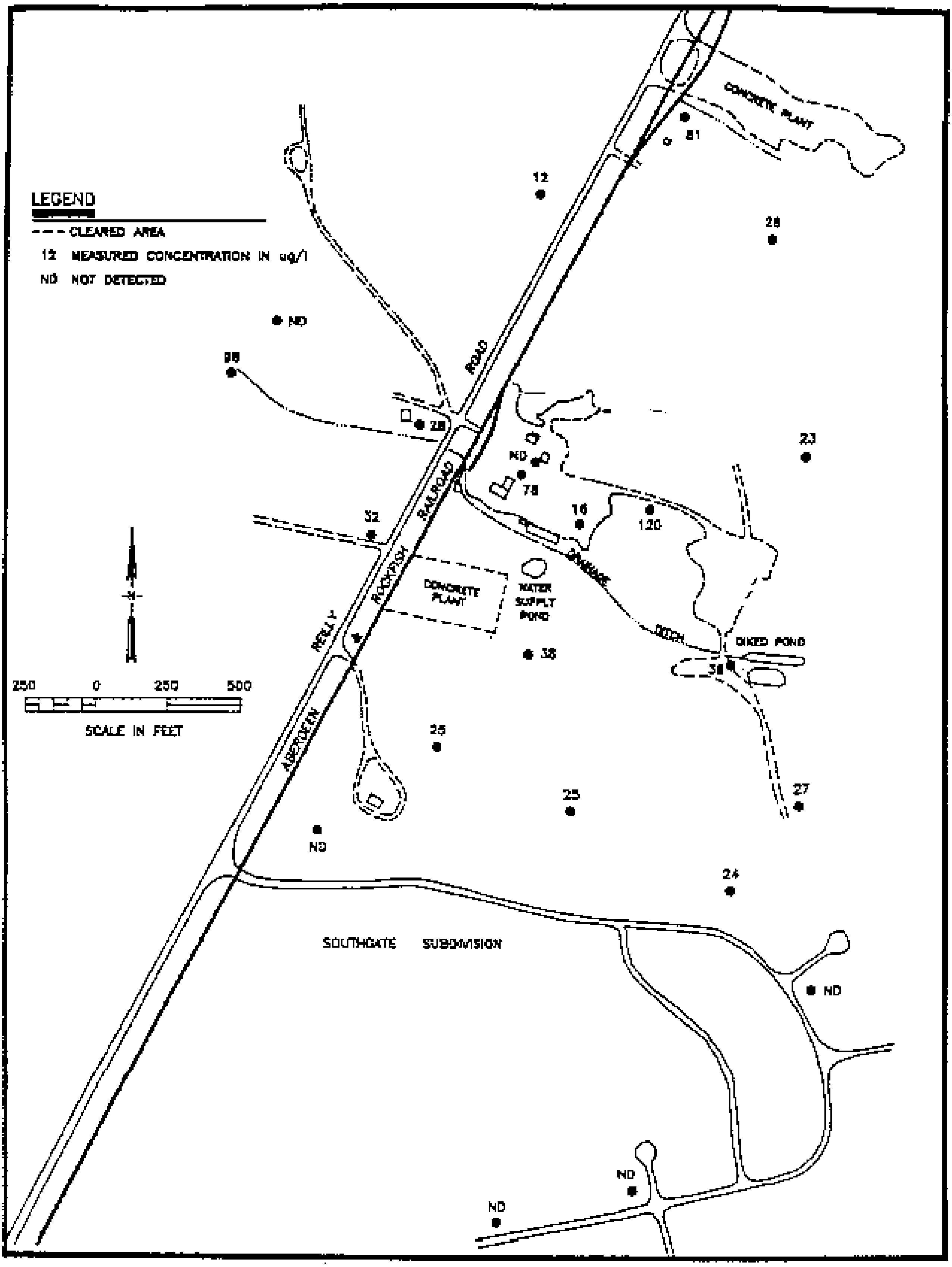
FIGURE NO.
18



ARSENIC CONCENTRATIONS IN UPPER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

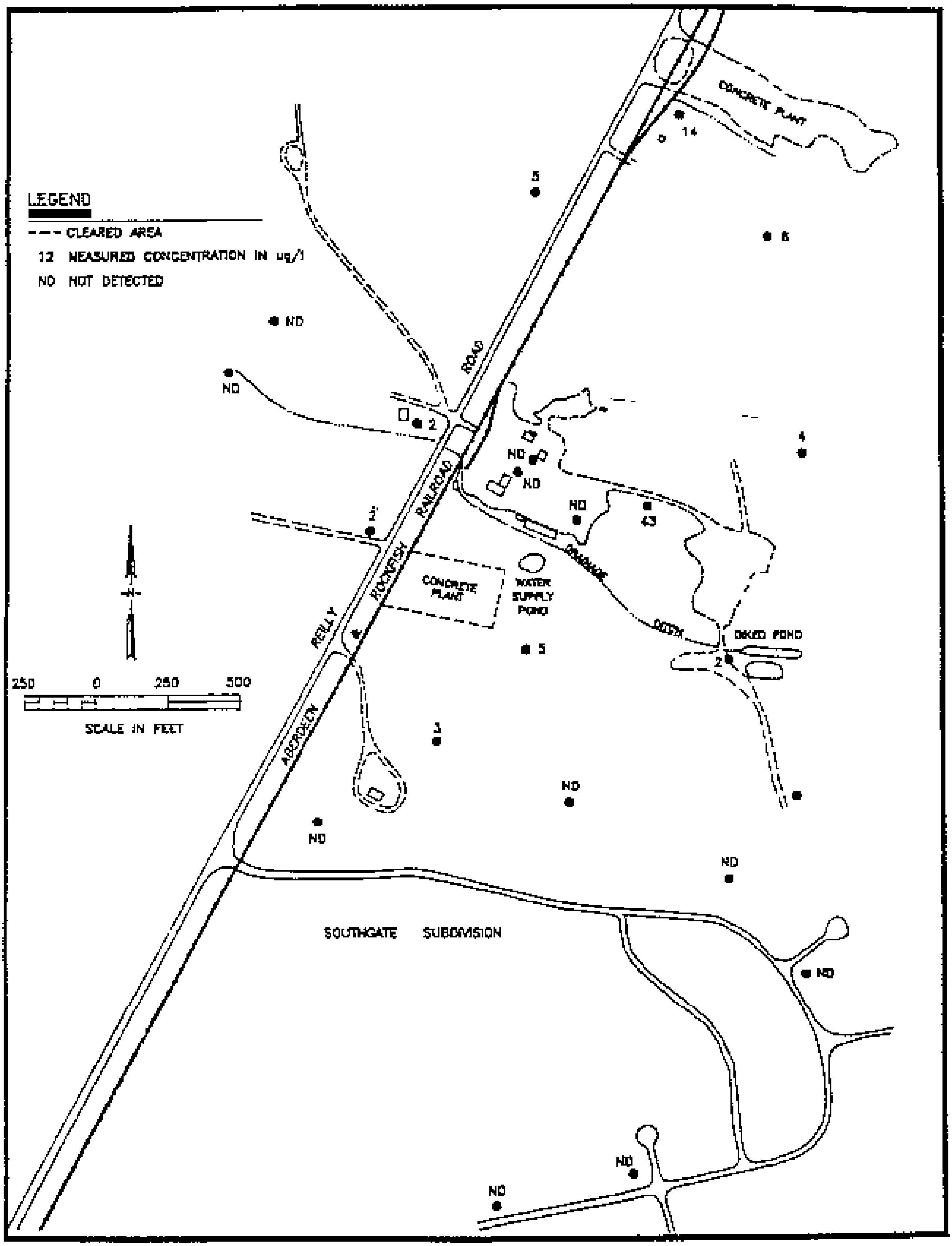
FIGURE NO. 19



CHROMIUM CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.
20



ARSENIC CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 21

TABLE 5

GROUND WATER SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	ARARS[1]	Other Guidance	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9
	MCL[2]	MCLG[3]	2/10/88	2/7/88	2/10/88	2/24/88	2/10/88	2/12/88	2/10/88	2/25/88	2/10/88
Inorganic Chemicals(ug/l)											
Aluminum	NA	NA	1800J	33000	1300J	3600J	3500J	1200J	1700J	31000J	2900J
Arsenic	50	50(P)	-	-	-	2	12JN	-	-	43	-
Barium	1000	1500(P)	-	220	-	56	-	-	-	210	-
Chromium	50	120(P)	10J	98	11J	28JN	31J	78J	9J	120JN	-
Copper	1000(S)	1300(P)	17J	26	19J	11	65J	170J	-	64	44J
Cyanide	NA	NA	-	-	-	-	40J	-	-	-	-
Iron	300(S)	NA	340J	24000	3100J	5400	2600J	5100J	12000J	63000J	980J
Lead	50	20(P)	-	22	-	-	-	-	-	42	-
Magnesium	NA	NA	640	4200	960	970	1100	800	520	2900	1100
Organic Chemicals (ug/l)											
Benzene	5	0	-	-	35	-	24	-	-	-	-
2,4-Dimethylphenol	NA	NA	-	-	140	-	-	-	5J	-	-
Ethylbenzene	NA	680(P)	-	-	24	-	40	-	11	-	-
Styrene	NA	140(P)	-	-	2J	-	7	-	-	-	-
Toluene	NA	2000(P)	-	-	20	-	50	-	-	-	-
1,1,1-Trichloroethane	200	200	-	2J	-	-	-	-	-	-	-
Xylenes	NA	440(P)	-	-	50	-	150	-	12J	-	-
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	120	-	46	-	200	-	-
Acenaphthylene	NA	NA	-	-	7J	-	-	-	13	-	-
Anthracene	NA	NA	-	-	-	-	-	-	160	2J	-
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	5J	-	-
Chrysene	NA	NA	-	-	-	-	-	-	7J	-	-
Dibenzofuran	NA	NA	-	-	82	-	40	-	140	-	-
Fluoranthene	NA	NA	-	-	-	-	4J	-	50	-	-
Fluorene	NA	NA	-	-	35	-	9J	-	170	-	-
2-Methylnaphthalene	NA	NA	-	-	98	-	180	-	140	-	-
Naphthalene	NA	NA	-	-	38	-	1200	-	9J	-	-
Phenanthrene	NA	NA	-	-	24	-	24	-	160	3J	-
Pyrene	NA	NA	-	-	-	-	2J	-	41	-	-
Total PAHs	NA	NA	-	-	400	-	1500	-	1100	5	-

TABLE 5
(Continued)

	ARARS[1] MCL[2]	Other Guidance MCLG[3]	MW-10 2/23/88	MW-11 2/12/88	MW-12 2/24/88	MW-13 2/10/88	MW-14 2/25/88	MW-15 2/10/88	MW-15D[*] 2/10/88	MW-16 2/24/88	EW-01 2/10/88
Inorganic Chemicals(ug/l)											
Aluminum	NA	NA	8400J	6000J	8000J	12000J	13000J	39000J	24000J	4000J	-
Arsenic	50	50(P)	2	-	4	8JN	14	-	9JN	2	-
Barium	1000	1500(P)	116	-	84	-	100	-	-	89	-
Chromium	50	120(P)	38JN	47J	23JN	44J	81JN	93J	59J	32JN	-
Copper	1000(S)	1300(P)	12	38J	14	33J	44	36J	32J	20	13J
Cyanide	NA	NA	-	-	-	-	-	30J	90J	-	-
Iron	300(S)	NA	11000J	9300J	21000J	16,000J	23000J	16000J	11000J	11000J	17000J
Lead	50	20(P)	-	-	-	-	40	-	-	-	-
Magnesium	NA	NA	1000	920	1600	1000	1500	1400	1100	690	510
Organic Chemicals (ug/L)											
Benzene	5	0	-	-	-	-	-	-	-	-	2J
2,4-Dimethylphenol	NA	NA	-	-	-	-	-	-	-	-	13
Ethylbenzene	NA	680(P)	-	-	-	-	-	-	-	-	6
Styrene	NA	140(P)	-	-	-	-	-	-	-	-	-
Toluene	NA	2000(P)	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	200	200	-	-	-	-	11	-	-	-	-
Xylenes	NA	440(P)	-	-	-	-	-	-	-	-	15J
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	-	-	-	-	-	-	33
Acenaphthylene	NA	NA	-	-	-	-	-	-	-	-	-
Anthracene	NA	NA	-	-	-	-	-	-	-	-	3J
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	-	-	-
Chrysene	NA	NA	-	-	-	-	-	-	-	-	2J
Dibenzofuran	NA	NA	-	-	-	-	-	-	-	-	18
Fluoranthene	NA	NA	-	-	-	-	-	-	-	-	12
Fluorene	NA	NA	-	-	-	-	-	-	-	-	19
2-Methylnaphthalene	NA	NA	-	-	-	-	-	-	-	-	37
Naphthalene	NA	NA	-	-	-	-	-	-	-	-	680
Phenanthrene	NA	NA	-	-	-	-	-	-	-	-	23
Pyrene	NA	NA	-	-	-	-	-	-	-	-	11
Total PAHs	NA	NA	-	-	-	-	-	-	-	-	840

TABLE 5
(Continued)

	ARARS[1] MCL[2]	Other Guidance MCLG[3]	EW-02 2/12/88	MWS-1 2/8/88	MWD-2 2/8/88	MWS-3 2/9/88	MWD-4 2/24/88	MWS-5 2/9/88	MWD-6 2/8/88	MWS-7 2/9/88	MWD-8 2/23/88
Inorganic Chemicals(ug/l)											
Aluminum	NA	NA	-	29000J	4200J	24000J	3000J	650J	4600J	1100J	1900J
Arsenic	50	50(P)	-	8JN	6JN	-	3	-	-	-	5
Barium	1000	1500(P)	-	-	-	-	51	-	-	-	62
Chromium	50	120(P)	16J	220J	26J	99J	25JN	-	25J	-	38JN
Copper	1000(S)	1300(P)	68J	50J	24J	38J	16	16J	28J	26J	20
Cyanide	NA	NA	-	120J	170J	120J	-	10J	30J	-	-
Iron	300(S)	NA	40000J	9000J	1400J	24000J	6200J	380J	10000J	6100J	18000J
Lead	50	20(P)	-	-	-	-	-	-	-	-	-
Magnesium	NA	NA	690	1900	1000	520	550	-	780	-	570
Organic Chemicals (ug/l)											
Benzene	5	0	-	-	-	-	-	-	-	530J	-
2,4-Dimethylphenol	NA	NA	-	-	-	-	-	-	-	120	-
Ethylbenzene	NA	680(P)	-	-	-	-	-	-	-	760J	-
Styrene	NA	140(P)	-	-	-	-	-	-	-	550JN	-
Toluene	NA	2000(P)	2J	-	-	-	-	-	1J	-	-
1,1,1-Trichloroethane	200	200	-	-	-	-	-	-	-	-	-
Xylenes	NA	440(P)	-	-	-	-	-	-	-	2300J	-
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	-	-	-	-	-	350J	-
Acenaphthylene	NA	NA	-	-	-	-	-	-	-	23	-
Anthracene	NA	NA	-	-	-	-	-	-	-	61	-
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	-	9J	-
Chrysene	NA	NA	-	-	-	-	-	-	-	-	-
Dibenzofuran	NA	NA	-	-	-	-	-	-	-	200	-
Fluoranthene	NA	NA	-	-	-	-	-	-	-	70	-
Fluorene	NA	NA	-	-	-	-	-	-	-	200	-
2-Methylnaphthalene	NA	NA	-	-	-	-	-	-	-	-	-
Naphthalene	NA	NA	4J	3J	-	-	-	-	-	21000	-
Phenanthrene	NA	NA	-	-	-	-	-	-	-	180	-
Pyrene	NA	NA	-	-	-	-	-	-	-	-	-
Total PAHs	NA	NA	4	3	-	-	-	-	-	22000	-

TABLE 5
(Continued)

	ARARS[1] MCL[2]	Other Guidance MCLG[3]	MWS-9 2/8/88	MWD-10 2/8/88	MWS-11 2/9/88	MWD-12 2/12/88	DW-9 2/9/88	DW-11 2/9/88	DW-13 2/9/88	DW-14 2/9/88	DW-15 2/9/88
Inorganic Chemicals(ug/l)											
Aluminum	NA	NA	12000J	210J	5700J	1300J	-	-	130J	200J	-
Arsenic	50	50(P)	-	-	-	-	-	-	-	-	-
Barium	1000	1500(P)	-	-	-	-	-	-	-	-	-
Chromium	50	120(P)	930J	27J	24J	24J	-	-	-	-	-
Copper	1000(S)	1300(P)	67J	20J	46J	41J	16J	24J	31J	330J	24J
Cyanide	NA	NA	-	10J	-	-	-	-	-	10J	10J
Iron	300(S)	NA	190J	640J	1900J	1900J	-	-	-	300J	1200J
Lead	50	20(P)	-	-	-	-	-	-	-	-	-
Magnesium	NA	NA	520	390	500	440	-	930	750	620	490
Organic Chemicals (ug/l)											
Benzene	5	0	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	NA	NA	-	-	-	-	-	-	-	-	-
Ethylbenzene	NA	680(P)	-	-	-	-	-	-	-	-	-
Styrene	NA	140(P)	-	-	-	-	-	-	-	-	-
Toluene	NA	2000(P)	-	-	-	-	-	-	-	4J	-
1,1,1-Trichloroethane	200	200	-	-	-	-	-	-	-	-	-
Xylenes	NA	440(P)	-	-	-	-	-	-	-	-	-
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	-	-	-	-	-	-	-
Acenaphthylene	NA	NA	-	-	-	-	-	-	-	-	-
Anthracene	NA	NA	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	-	-	-
Chrysene	NA	NA	-	-	-	-	-	-	-	-	-
Dibenzofuran	NA	NA	-	-	-	-	-	-	-	-	-
Fluoranthene	NA	NA	-	-	-	-	-	-	-	-	-
Fluorene	NA	NA	-	-	-	-	-	-	-	-	-
2-Methy1naphthalene	NA	NA	-	-	-	-	-	-	-	-	-
Naphthalene	NA	NA	-	-	-	-	-	-	-	-	-
Phenanthrene	NA	NA	-	-	-	-	-	-	-	-	-
Pyrene	NA	NA	-	-	-	-	-	-	-	-	-
Total PAHs	NA	NA	-	-	-	-	-	-	-	-	-

TABLE 5
(Continued)

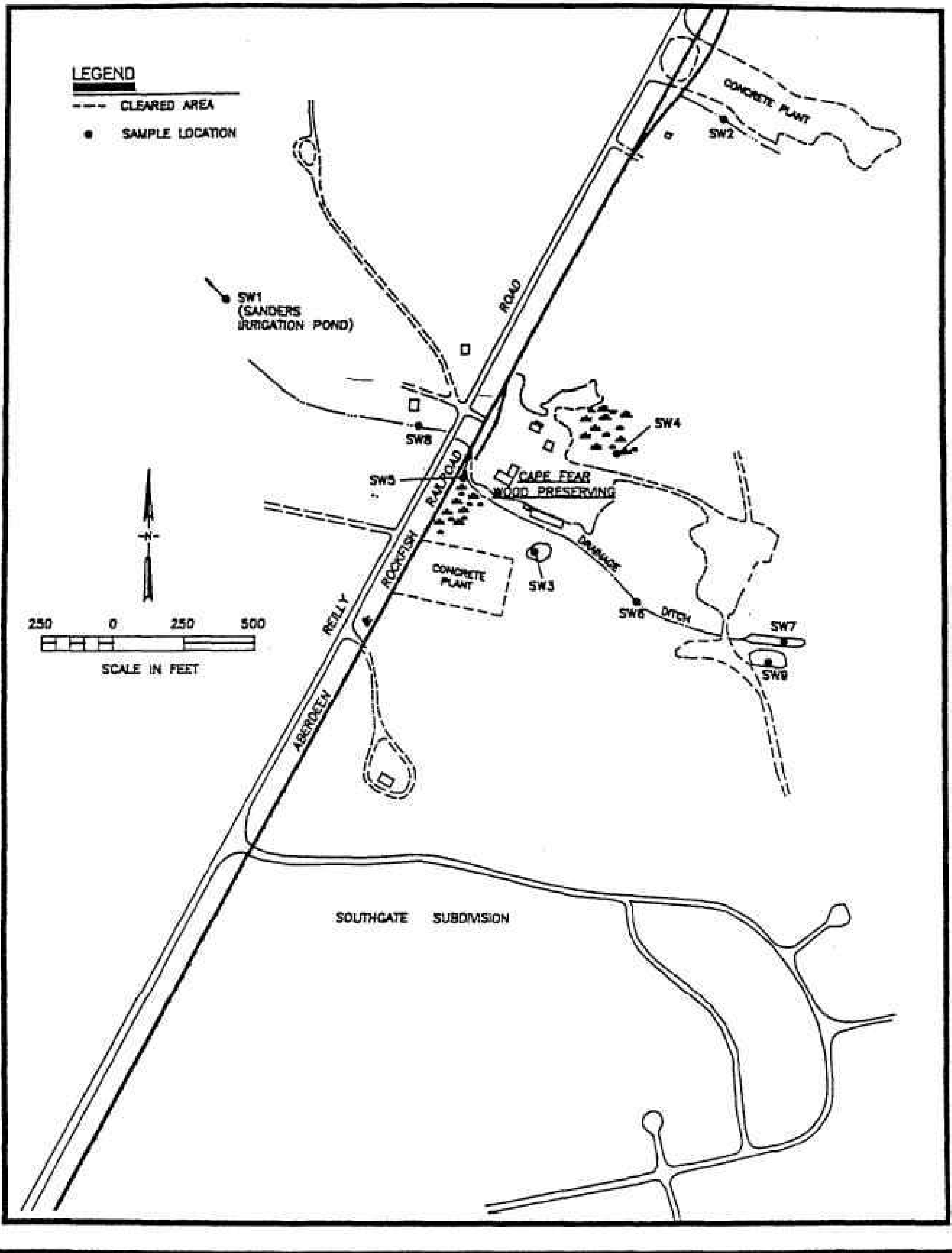
	ARARS[1] MCL[2]	Other Guidance MCLG[3]	DW-16 2/25/88	DW-16D 2/25/88	New Well 2/9/88
Inorganic Chemicals(ug/l)					
Aluminum	NA	NA	-	-	-
Arsenic	50	50(P)	-	5	-
Barium	1000	1500(P)	-	-	-
Chromium	50	120(P)	11J	12J	-
Copper	1000(S)	1300(P)	39J	37J	16J
Cyanide	NA	NA	-	-	-
Iron	300(S)	NA	15000J	22000J	-
Lead	50	20(P)	-	-	-
Magnesium	NA	NA	4600	4700	640
Organic Chemicals (ug/l)					
Benzene	5	0	-	-	-
2,4-Dimethylphenol	NA	NA	-	-	R
Ethylbenzene	NA	680(P)	-	-	R
Styrene	NA	140(P)	-	-	R
Toluene	NA	2000(P)	-	-	R
1,1,1-Trichloroethane	200	200	-	-	-
Xylenes	NA	440(P)	-	-	R
PAHs (ug/l)					
Acenaphthene	NA	NA	-	-	-
Acenaphthylene	NA	NA	-	-	-
Anthracene	NA	NA	-	-	-
Benzo(a)anthracene	NA	NA	-	-	-
Chrysene	NA	NA	-	-	-
Dibenzofuran	NA	NA	-	-	-
Fluoranthene	NA	NA	-	-	-
Fluorene	NA	NA	-	-	-
2-Methy1naphthalene	NA	NA	-	-	-
Naphthalene	NA	NA	-	-	-
Phenanthrene	NA	NA	-	-	-
Pyrene	NA	NA	-	-	-
Total PAHs	NA	NA	-	-	-

[1] Applicable or Relevant and Appropriate Requirements (see Risk Assessment)
[2] Federal Maximum contaminant Level (see Risk Assessment)
[3] Federal Maximum Contaminant Level Goal (see Risk Assessment)

NA = Not Available; criterion has not been developed for this chemical.
(P) = Proposed
(S) = Secondary MCL based on taste and odor

Concentration Footnotes

S = The compound was analyzed for but not detected.
J = This number is estimated. The qualitative analysis is acceptable, but the value cannot be considered as accurate.
N = Presumptive evidence of presence of material. There is evidence that the material is present, but for some reason or combination of reasons, it has not been confirmed.
R = Data are rejected and are totally unusable.
JN = The identification is tentative and the value is estimated.
* Duplicate Sample.



SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 22

TABLE 6

SURFACE WATER SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	ARARs[1]	SW-1 2/7/88	SW-2 2/7/88	SW-3 2/7/88	SW-4 2/7/88	SW-5 2/7/88	SW-5D* 2/7/88	SW-6 2/7/88	SW-7 2/7/88	SW-8 2/7/88	SW-9 2/7/88
Inorganic Chemicals (ug/l)											
Aluminum	NA	-	500J	410J	700J	4,200J	990J	1,000J	950J	930J	800J
Arsenic	50	-	-	-	390	170JN	170	310	210	-	-
Chromium	50	-	-	-	67J	94J	43J	55J	39J	-	59J
Copper	15	14J	21J	150J	160J	79J	57J	70J	42J	20J	22J
Iron	1,000	130J	2,400J	1,200J	340J	4,600J	1,200J	2,600J	2,100J	610J	180J
PAHs (ug/l)											
Anthracene	NA	-	-	-	-	28J	-	-	-	-	-
Benzo(a)anthracene	NA	-	-	-	-	1J	-	-	-	-	-
Chrysene	NA	-	-	-	-	3J	-	-	-	-	-
Fluoranthene	NA	-	-	-	-	1J	-	-	-	-	-
Pyrene	NA	-	-	-	-	3J	-	-	-	-	-
Total PAHs	NA	-	-	-	-	36	-	-	-	-	-

[1] - Applicable or Relevant and Appropriate Requirements (see Risk Assessment).

Footnotes
S = The compound was analyzed for but not detected.
J = This number is estimated. The qualitative analysis is acceptable, but the value cannot be considered as accurate.
N = Presumptive evidence of presence of material. There is evidence that the material is present, but for some reason or combination of reasons, it has not been confirmed.
R = Data are rejected and are totally unusable.
JN = The identification is tentative and the value is estimated.
* = Duplicate sample.
NA = Not available; has not been developed for this chemical.

TABLE 7

SEDIMENT SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	SD-1	SD-2	SD-3	SD-4	SD-4D*	SD-5	SD-6	SD-7	SD-8	SD-9
	2/7/88	2/7/88	2/7/88	2/7/88	2/7/88	2/7/88	2/7/88	2/7/88	2/7/88	2/7/88
Inorganic Chemicals (mg/kg)										
Aluminum	95	22,000	2,800	1,400	1,500	13,000	7,500	1,500	8,600	15,000
Arsenic	-	25JN	4.6JN	90JN	120JN	130JN	-	100JN	16JN	5.8JN
Chromium	-	660	9.4	220	330	160	12	110	28	17
Copper	28	830	9.6	83	110	30	7.3	12	15	1,000
Iron	160	16,000	1,700	810	910	4,000	9,800	750	9,800	12,000
Magnesium	-	4700	-	-	-	160	-	-	230	260
PAHs (ug/kg)										
Acenaphtene	-	-	-	13J	-	-	-	14,000	-	-
Acenapthylene	-	-	-	16J	-	-	-	-	-	-
Anthracene	-	-	-	60J	41J	720J	-	12,000	8J	-
Benzo(a)anthracene	-	-	-	-	170J	4,500J	-	6,200J	-	-
Benzo(b and/or k)fluoranthene	-	-	-	730J	320J	-	-	-	-	-
Benzo(a)pyrene	-	-	-	220J	130J	-	-	-	-	-
Chrysene	-	-	-	310J	330J	6,900J	-	8,000J	54J	-
Dibenzofuran	-	-	-	-	-	-	-	11,000	-	-
Fluoranthene	-	-	-	370J	380J	36,000	-	50,000	51J	40J
Fluorene	-	-	-	12J	-	-	-	25,000	-	-
2-Methylnaphthalene	R	25J	R	R	R	R	R	1,700J	R	R
Naphthalene	-	-	-	-	-	-	-	790J	-	-
Phenanthrene	-	-	-	-	-	-	-	62,000	-	-
Pyrene	-	25J	-	350J	410J	32,000	-	41,000	43J	17J
Total PAHs	-	50	-	2,100	1,800	80,000	-	230,000	160	57

Footnotes
S = The compound was analyzed for but not detected.
J = This number is estimated. The qualitative analysis is acceptable, but the value cannot be considered as accurate.
N = Presumptive evidence of presence of material. There is evidence that the material is present, but for some reason or combination of reasons, it has not been confirmed.
R = Data are rejected and are totally unusable.
JN = The identification is tentative and the value is estimated.
* = Duplicate sample.

Although SW-2/SD-2 samples were intended to be background samples, the analytical results indicate otherwise. Highly elevated levels of some inorganic chemicals and the detection of PAHs, particularly in the sediment sample, indicate that this surface water has been influenced by some source of contamination. It is very unlikely the source of this contamination is site-related since the SW-2/SD-2 sampling point is approximately a quarter of a mile from the site. Because of the uncertainty associated with these samples, however, the analytical results were dropped from consideration as representing background concentrations.

In general, analyses of the surface water and sediment samples indicate contamination by PAHs and a few inorganic chemicals. The greatest concerns lie with the drainage ditch and diked pond to the south, and the seasonal swamp to the northeast where elevated levels of aluminum, arsenic, chromium, copper, iron and PAHs were found. Elevated levels of these contaminants were also found in the former water supply pond, the drainage ditch to the west and the concrete plant discharge pond to the southeast, but contamination in these surface water features is not as significant.

The elevated levels of arsenic, chromium, copper and PAHs found in the surface water and sediment samples taken near the site are most likely site-related since these chemicals were used extensively in past wood preserving operations at the site. Aluminum and iron contamination, however, is not expected to be site-related. The elevated concentrations of these chemicals are most likely due to natural conditions at the site. These chemicals are typical components of the soils in the study area and the low pH of surface water and groundwater in the area is probably causing them to leach from the soils into the water system where they can be easily transported. Field measurements of pH of natural waters at the site ranged from 3.7 to 7.9 and averaged 5.3.

3.7 RISK ASSESSMENT SUMMARY

The chemicals of potential concern identified for the site are inorganic compounds, polycyclic aromatic hydrocarbons (PAHs) and benzene. The inorganic compounds include chromium and arsenic.

Due to the uncertainty of land use in and around the site, several different land use scenarios were evaluated. The exposure pathways identified under current land use conditions (keep undeveloped with minimal industrialization) are the following:

- direct contact with contaminated surface soils by children trespassing on the site,

- inhalation of fugitive dust originating from contaminated soil areas by site trespassers and nearby residents, and

- contact with contaminated sediments by children wading on-site in the diked pond and drainage ditch.

Additional human exposure pathways are relevant if the future use of the site and surrounding area becomes either more industrial or residentially oriented. These additional exposure pathways are:

- direct contact with contaminated surface soils by future residents and workers,
- inhalation of fugitive dust originating from contaminated soil areas by future workers, and
- ingestion of groundwater from the upper and lower aquifers.

Because "applicable and relevant or appropriate requirements" (ARARs) are not available for all chemicals in all environmental media, risks were also quantitatively assessed for the identified exposure pathways. For lifetime exposures (70 years), risks were estimated assuming exposure concentrations remained constant over time.

Estimates of risks under current land use conditions are as follows. For direct contact with surface soils for children trespassing onsite, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under the average case and 1 person out of 200,000 under the plausible maximum case. Risk under the plausible maximum case is due to carcinogenic PAHs. For inhalation of fugitive dust by onsite trespassers, individuals of the Jackson residence and residence in the Southgate subdivision, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under average and plausible maximum cases. For children wading in onsite surface water and exposed to chemicals of potential concern in sediments, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under average cases and 1 person out of 100,000 under a plausible maximum case. No carcinogenic chemicals of potential concern are detected in the residential wells, therefore ingestion of drinking water by current residents with residential wells, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000.

Estimates of risks under hypothetical future land use conditions are as follows. For potential exposure associated with direct contact with the soil at the site by future residents, the lifetime excess upper bound concern risk is 1 person out of 3,000,0000 under the average case and 1 person out of 1,000 under the plausible maximum case. Risks under both cases are due primarily to carcinogenic PAHs; under the plausible maximum case, the risk is due to arsenic is 1 person out of 200,000. For direct contact with soils by future workers onsite, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under average case and 1 person out of 200,000 under the plausible maximum case. Risk under the plausible maximum case is due primarily to carcinogenic PAHs; the risk from arsenic under the plausible maximum case is 1 person out of 3,000,000. The risk associated with exposure to chemicals at the maximum detected sample concentrations would result in lifetime excess cancer risks of 1 person out of 8,000. For inhalation of fugitive dust by future workers onsite, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under the average and plausible maximum cases. Ingestion of groundwater from the upper aquifer by future residents, the lifetime excess upper bound cancer risk is 1 person out of 4,000 under the average case and 1 person out of 6,000 under the plausible maximum case. And ingestion of groundwater from the lower aquifer by future residents, the lifetime excess upper bound cancer risk is less than 1 person out of 20,000 under the average case and 1 person out of 2,000 under the plausible maximum case.

Potential environmental impacts of the chemicals of potential concern at the site were also evaluated. Plant and animal species potentially exposed to the chemicals of concern at the site were identified based on a knowledge of the site and surrounding habitat. Risks were assessed by comparing the reported environmental concentration or the estimated dose with the selected toxicity value. Absolute conclusions regarding the potential environmental impacts at the Cape Fear Site cannot be made because there are many uncertainties surrounding the estimates of toxicity and exposure.

The maximum concentrations of arsenic, chromium, copper and lead found in the soils of the site exceed levels known to be phytotoxic in at least some species. The geometric mean concentrations of arsenic and chromium in the soils from the processing area are close to the levels toxic to some species and are possibly at concentrations that are toxic to species which occur in the area of the Cape Fear Site. Conclusions regarding adverse impacts to plants at the site are supported by the lack of vegetation across large areas of the site. Portions of the site that remain without vegetation offer little value as wildlife habitat and thus, the habitat value of the area is reduced.

Small mammals and deer that potentially use the surface water of the Cape Fear Site as a drinking water source do not appear to be at increased risk of adverse impacts, as the estimated intakes are well below those estimated to be associated with toxic effects. Birds ingesting water from the northeast swamp, ditch-diked pond area, and concrete plant discharge pond may be at increased risk of adverse impact from chromium as estimated intakes are approximately equal to the derived toxicity value. This may be of particular concern for red-cockaded woodpeckers, an endangered species potentially occurring in the area, a loss of even a single individual could adversely affect reproduction (and thus, the population) of this already stressed species. There are, however, many uncertainties surrounding the derivation of the toxicity values and the estimated intakes and therefore, absolute conclusions cannot be made.

Adverse impacts may also be occurring in the surface waters of the site. The concentrations of arsenic in the northeast swamp and the ditch-diked pond area exceed the acute and chronic Ambient Water Quality Criteria (AWQC) for this chemical. Chromium concentrations in the northeast swamp, the ditch-diked pond area and the concrete plant discharge pond exceed the acute and chronic AWQC. Copper concentrations exceed the acute and chronic criteria in the water supply pond, the northeast swamp, and the ditch-diked pond area. Aquatic species most likely impacted are insects, other invertebrates, and aquatic plants. It is difficult to determine the impact of these adverse effects on the aquatic populations of the area. However, the observed levels of contaminants in some of the surface waters at the site probably result in an exclusion of aquatic life in these waters, or a shift in community structure towards species more tolerant of high metal concentrations.

4.0 CLEANUP CRITERIA

The extent of contamination was defined in Section 3.0, Current Site Status. This section examines the ARARs associated with the contaminants found on site and the environmental medium contaminated. In the cases where no specific ARAR can be identified, a defendable remediation goal was generated. Table 8 provides a summary of the environmental mediums contaminated , the clean-up goals for the contaminants of concern in each medium, and a rationale for each specified clean-up goal.

4.1 GROUNDWATER REMEDIATION

In determining the degree of groundwater clean-up, Section 121(d) of the Superfund Amendment and Reauthorization Act of 1986 (SARA) requires that the selected remedial action establish a level or standard of control which complies with all ARARs, be cost-effective and achieve a clean-up level that is protective of human health and the environment. Finally, the remedy should utilize permanent treatment technologies to the maximum extent practicable.

For those contaminants found in the groundwater at the site, Table 8 presents the remediation levels the migration remedial alternative will achieve, at a minimum.

4.2 SOIL REMEDIATION

The Public Health and Environmental Assessment in the RI (Chapter 4), determined that risks to human as a result of exposure to on-site contaminants via inhalation, ingestion and dermal contact are very low under present Site conditions. For potential future use scenarios, the risk is slightly higher. Therefore, remediation and institutional controls will be necessary to assure that an increased risk to human health is not posed in the future.

Table 8 presents clean-up remediation levels that the source remediation alternative will achieve.

TABLE 8

SUMMARY OF CONTAMINATED MEDIA AND CLEANUP GOALS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Media	Site Related Contaminants Exceeding ARARs, Risk Assessment Values, or Environmental Criteria	Clean Up Goals	Rationale for Clean Up Goals
		ug/liter	
Ground Water	Benzene	5	a
	PAHs (carcinogenic)	10	b
	PAHs (noncarcinogenic)	14,350	c
		ug/liter	
Surface Water	Arsenic	12	d
	Chromium (total)	11	d
	Copper	14	e
		mg/kg	
Soil	Arsenic	94	c, f
	Benzene - Leachate Case	0.005	b
	Chromium (total) - Leachate Case	88	g
	PAHs (carcinogenic)	2.5	c, h
	PAHs (total)	100	i
		mg/kg	
Sediment	PAH (total)	3.0	j
	Arsenic	94	k
	Chromium (total)- Leachate Case	88	k

(a) ARAR = Maximum Contaminant Level (MCL).

(b) The Contract Laboratory Required Quantitation Limit (CLRQL) is proposed since the calculated risk assessment value is below analytical detection limits. Should the CLRQL reduce with time as analytical procedures improve, the new (lower) CLRQL would become the cleanup goal.

(c) Value derived using reverse risk assessment techniques.

TABLE 8
(continued)

(d) ARAR = Ambient Water Quality Criteria.

(e) The goal represents background conditions since the Ambient Water Quality Criteria Concentration (6.5 ug/l) is below background.

(f) The future use worker scenario is used since this is the more likely future land use and arsenic is not posing a significant risk under current use conditions.

(g) The goal represents site background conditions (maximum of the range observed) since the calculated risk assessment value is below background levels.

(h) The value listed represents a current use scenario since this is more conservative than the levels derived for the future use worker scenario.

(i) Value is based on typical background concentrations (from the literature) since the calculated level necessary to prevent future leachate from exceeding a hazard index of 1 in ground water (60 mg/kg) is less than representative background conditions.

(j) Concentration researched by EPA to be protective of aquatic biota.

(k) The same value proposed for soils is applied due to a similar human exposure route, and low expected impact to surface water on a volumetric basis.

4.3 SURFACE WATER/SEDIMENT REMEDIATION

The following areas have been targeted for remediation: the water supply road, the northeast seasonal swamp, the drainage ditch south and west of the railroad tracks, the diked pond and the drainage ditch. The level of clean-up for the surface waters and sediment are also stated in Table 8.

5.0 ALTERNATIVES EVALUATED

The purpose of the remedial action at the Cape Fear Site is to minimize, if not mitigate contamination in the soils, groundwater, and surface waters and sediment and to reduce, if not eliminate, potential risks to human health and the environment. The following clean-up objectives were determined based on regulatory requirements and levels of contamination found at the Site:

- To protect the public health and the environment from exposure to contaminated on-site soils through inhalation, direct contact, and erosion of soils into surface waters and wetlands;

- To prevent off-site movement of contaminated groundwater; and

- To restore contaminated groundwater to levels protective of human health and the environment.

Table 9 provides a list of possible remedial technologies applicable at the Cape Fear Site knowing the environmental media affected, the type of contaminants present and the concentration of each contaminant in each environmental medium. Table 10 lists those technologies retained after the initial screening. This initial screening evaluates the technologies on the following technical parameters:

- implementability,

- reliability and effectiveness, and

- previous experience.

These technologies address soils/sediments, surface water and groundwater and the hazardous material, tanks and piping and best meet the criteria of Section 300.65 of the national Contingency Plan (NCP).

Following the initial screening of the individual technologies, these technologies were combined to form a number of remedial action alternatives. These alternatives address the contaminated soils and sediments, surface water and groundwater, and hazardous materials, tanks and piping, and are listed in Tables 11 through 13, respectively. These remedial action alternatives are than screened and analyzed in relation to the nine point criteria.

TABLE 9

POSSIBLE REMEDIAL TECHNOLOGIES FOR SOIL AND SEDIMENTS AND GROUNDWATER AND SURFACE WATER

Response Action	Technology
SOIL AND SEDIMENTS	
Removal	Excavation Sediment Dredging and Dewatering
Treatment	Attenuation Washing Flushing Immobilization Biodegradation Thermal Processing Incineration
Containment/ Migration Control	Capping On-site Encapsulation/Landfill Solidification/Stabilization Vitrification Subsurface Barriers Off-site Landfill
GROUNDWATER AND SURFACE WATER	
Collection	Extraction Wells Subsurface Drains
Treatment	Air Stripping Steam Stripping Aeration Spray Irrigation Vacuum Extraction Flocculation, Sedimentation, Filtration Activated Carbon Adsorption Precipitation Ion Exchange Reverse Osmosis
Disposal	Discharge to Surface Water Publicly Owned Treatment Works Plant Aquifer Recharge

TABLE 10

RETAINED TECHNOLOGIES, APPLICABLE MEDIA, AND CONTAMINANTS
CONSIDERED FOR ALTERNATIVES DEVELOPMENT
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Media	Response Action	Remedial Technology	Applicable to
Soil/Sediment	Removal	Excavation	Soils > cleanup goals.
		Dredging	Sediments > cleanup goals.
	Containment	Capping	Soils and dawatered sediments, all contaminants of interest: As, benzene, Cr, PAHs.
	Treatment	Washing	Soils and sediments, all contaminants of interest: As, benzene, Cr, PAHs.
		Thermal Processing	Soils and sediments, organic contaminants: benzene and PAHs.
		Solidification/stabilization	Soils and sediments with As and Cr contamination.
Ground water/ surface water	Removal	Well Points	Upper aquifer, extraction of ground water > cleanup goals.
		Deep Well	Lower aquifer, extraction of ground water > cleanup goals.
		Pumping	Transfer of ground water and surface water > cleanup goals.
	Treatment	Flocculation, sedimentation, and filtration	Particulate removal in ground water and surface water in association with other treatment technologies (carbon adsorption, precipitation).
		Carbon Adsorption	Removal of organic and some inorganic constituents in ground water and surface water.
		Air Stripping	Removal of volatile organics (benzene) from ground water.
		Precipitation	Removal of metals (As, total Cr, Cu) from surface water and onsite wastewater.
	Discharge	To surface water	Treated effluent.
		To POTW	Pretreated effluent.

TABLE 10
(Continued)

Media	Response Action	Remedial Technology	Applicable to
Hazardous Materials, Tanks, and Piping	Removal	Excavation	Pipelines and the underground fuel tank.
		Containerization	Apparent CCA crystals, assumed asbestos insulation, creosote-contaminated solidified sludge, CCA solution.
		Offsite Transport	CCA solution.
	Containment	Solidification/stabilization	Creosote-contaminated solidified sludge.
	Treatment	Reduction	CCA solution and CCA wastewater, Cr^{+6} treatment if necessary. (Reduction of Cr^{+6} to Cr^{+3} .)
		Precipitation	CCA solution, CCA contaminated wastewater, and surface water treated onsite.
	Disposal	Offsite Landfill	Apparent CCA crystals, assumed asbestos insulation, creosote-contaminated solidified sludge, CCA solution, CCA contaminated wastewater, tanks and piping.
		Scrap Metal	Tanks and piping.

As = Arsenic
Cr = Chromium (total)
Cr^{+6} = Hexavalent chromium
Cu = Copper
PAH = Polycyclic aromatic hydrocarbons

TABLE 11

DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES
FOR SOILS/SEDIMENTS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Alternative	Technologies Employed
1S*	No action Natural flushing
2S	Excavate isolated areas of soil contamination Excavate/dredge sediments Dewater dredged sediments Cap soils and dewatered sediments
3S	Excavate/dredge soils and sediments Wash excavated materials onsite Water supply source: A. Purchase from Fayetteville Public Works Commission and truck to the site. B. Purchase from a private water company and pipe to the site. C. Install an onsite well outside the contaminant plume area. Redeposit washed soils/sediments in the excavated area
4S	Excavate/dredge soils/sediments Dewater dredged sediments Thermal process excavated materials Solidify/stabilize processed soils/sediments and redeposit in the excavated area.

*S denotes remedial alternative for soil/sediment.

TABLE 12

DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES
FOR GROUND WATER AND SURFACE WATER
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Alternative	Technologies Employed
1W*	No action Long-term ground water monitoring
2W	Ground water extraction by well points and a deep well Flocculation, sedimentation, and filtration (surface and ground water) Activated Carbon Adsorption (surface and ground water) Discharge treated effluent to surface water (western ditch)
3W	Ground water extraction by well points and a deep well Flocculation, sedimentation, and filtration (ground water and surface water) Air stripping (ground water) Activated carbon adsorption (surface and ground water) Discharge treated effluent to surface water (western ditch)
4W	Ground water extraction by well points and a deep well Ground water treatment Filtration Air Stripping Activated carbon adsorption Surface water treatment Precipitation Flocculation, sedimentation, and filtration Discharge treated effluent to surface water (western ditch)
5W	Ground water extraction by well points and deep well(s) Pretreatment Precipitation (surface and ground water) Flocculation, sedimentation, and filtration (surface and ground water) Discharge to POTW

*W denotes remedial alternative for ground water or surface water.

TABLE 13

DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES
FOR HAZARDOUS MATERIALS, TANKS, AND PIPING
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Material	Alternative*	Technologies Employed
Apparent CCA Crystals**	1C	Offsite landfill (hazardous).
Asbestos Insulation** (Assumed)	1A	Offsite landfill (nonhazardous).
Solidified Sludge	1SS	Onsite disposal.
	2SS	Offsite landfill (hazardous).
CCA Wastewater and/or CCA 3% Solution	1L	Treat wastewater and solution onsite for Cr^{+6}. Treat wastewater and solution onsite with surface waters.
	2L	Treat wastewater and solution offsite.
	3L	Transport CCA solution offsite.
Tanks and Piping	1T/P + 2T/P	Locate (Piping) Empty (Tanks) Excavate (UST and Piping) Drain/Purge (Piping) Clean (Tanks and Piping) Cut (Tanks and Piping)
		Dispose of as:
	1T/P	Scrap metal
	2T/P	at an offsite landfill (nonhazardous)

*C denotes Crystals (apparent CCA)
A denotes Asbestos (assumed)
SS denotes Solidified Sludge
L denotes Liquid (CCA Wastewater and/or CCA 3% Solution)
T/P denotes Tanks/Piping

**Based on visual characterization. These materials were not sampled.

UST - Underground Storage Tank.

5.1 NINE POINT EVALUATION CRITERIA FOR EVALUATING REMEDIAL ACTION ALTERNATIVES

Each alternative was evaluated using a number of evaluation factors. The regulatory basis for these factors comes from the National Contingency Plan (NCP) and Section 121 of SARA. Section 121(b)(1) states that, "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants and contaminants as a principal element, are to be preferred over remedial actions involving such treatment. The offsite transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available."

Section 121 of SARA also requires that the selected remedy be protective of human health and the environment, cost-effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Based on the statutory language and current U.S. EPA guidance, the nine criteria used to evaluate the remedial alternatives listed above were:

1. Overall Protection of Human Health and the Environment addresses whether or not the remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with ARARs addresses whether or not the remedy will meet all of the applicable or relevant and appropriate requirements of other environmental statues and/or provide grounds for invoking a wavier.

3. Long-Term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

4. Reduction of toxicity, mobility, or volume is the anticipated performance of the treatment technologies a remedy may employ.

5. Short-term effectiveness involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

6. Implementability is the technical and administrative feasibility of a remedy including the availability of goods and services needed to implement the chosen solution.

7. Cost includes capital and operation and maintenance costs.

8. Support Agency Acceptance indicates whether, based on its review of the RI/FS and Proposed Plan, the support agency (IDEM) concurs, opposes, or has no comment on the preferred alternative.

9. Community Acceptance indicates the public support of a given remedy. This criteria is discussed in the Responsiveness Summary.

5.1.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

All of the alternatives, with the exception of the no action alternative, would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk from the environment through treatment, engineering controls or institutional controls. As the no action alternative does not satisfy the remedial action goal to provide adequate protection of human health and the environment, it is not eligible for selection. The aspects considered in this evaluation are summarized in Table 14.

5.1.2 COMPLIANCE WITH ARARS

All of the alternatives, except for the no action alternative, would meet all applicable or relevant and appropriate requirements of Federal and State environmental laws. Section 6.6 (Table 21) lists the environmental regulations, policies and guidelines that are applicable to the Cape Fear site. Table 15 presents a summary of this evaluation.

Since all contamination on site is characterized as contaminted soil and debris and there is no RCRA characterized waste on-site, land ban requirements, as defined in 40 CFR 268, are not applicable at the Cape Fear site.

5.1.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

The aspects of this evaluation are summarized in Table 16 under the column entitled “Long Term Remediation Impact.

5.1.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

The aspects of this evaluation are also summarized in Table 14 under the column entitled “Long Term Remediation Impact”.

5.1.5 SHORT-TERM EFFECTIVENESS

The aspects of this evaluation are summarized in Table 16 under the column entitled “Short Term Remediation Impact”.

TABLE 14

SUMMARY Of REMEDIAL ALTERNATIVES EVALUATION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Remedial Alternative		Technical Considerations	Public Health and Environmental Considerations		Institutional Considerations	Estimated Time For Implementation (years)	Cost (Millions $)	
			Short Term Remediation Impact	Long Term Remediation Impact			Total Present Worth	Range Based on Sensitivity Analysis
1S:	No action	Does not remove or contain contaminants.	Not applicable.	Not applicable.	Future land use and deed restrictions.	0	0	0
2S:	Partial excavation/dredging of soils and sediments with surface capping	Contaminants are stored, not destroyed or removed. This is an effective process to prevent direct contact with contaminated materials and minimize vertical infiltration. Contaminated soils below the ground water table are not addressed.	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) could also be disturbed.	Decrease in contaminant mobility and reduction of direct contact risk.	Future land use and deed restrictions.	0.75	2.80	2.29-3.30
3S:	Excavation/ dredging with soil and sediment washing	Soil/sediment washing is considered to be an innovative technology for hazardous applications. The ability to meet cleanup goals for organic and inorganic contaminants must be demonstrated by treatability testing. Promising results have been obtained for PAHs. CCA will be more difficult to remove.	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) could also be disturbed.	Decreases in contaminant mobility and volume, reduced direct contact risk, and reduced leaching to ground water/surface water.	Future development allowed.	1.5	11.00	4.30-20.01

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost (Millions $): Total Present Worth	Cost (Millions $): Range Based on Sensitivity Analysis
4S: Excavation/ dredging of soils/sediments with thermal processing and/or solidification	This combination of technologies is expected to exceed cleanup goals since separate treatment is provided for organic and inorganic contaminants. A laboratory "burn" would be required to establish operating parameters. Leachate testing would be required for solidi-fied materials. Volume increase from solidification may be objectionable.	Potential air emissions during thermal processing could contain toxic gases (metal oxides). Dis-placement of aquatic biota and endangered plant species (if present) during excavation/ dredging.	Decreases contami-nant M/T/V. Direct contact risk and contaminant leaching to surface and ground water should be greatly reduced.	Future develop-ment allowed.	1.5	14.03	5.67-26.14
GROUND WATER AND SURFACE WATER ALTERNATIVES							
1W: No action Long-Term Monitoring	Does not remove or contain contaminants. ARARs are exceeded. Monitors offsite contaminant migration.	Not applicable.	Not applicable.	Deed restriction for consumptive ground water use.	30 (monitoring)	0.59	N/A

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost (Millions $): Total Present Worth	Cost (Millions $): Range Based on Sensitivity Analysis
2W: Flocculation, Sedimentation, Filtration Carbon Adsorption Discharge to Surface Water	It is expected that cleanup goals for PAHs will be met. Contaminants concentrations for benzene, copper, chromium and arsenic will be reduced but meeting ARARs is less certain. Testing would be required to assess the achievable contaminant reductions. Recovery of the full ground water plume will require offsite access/easements.	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, and endangered species.	NPDES permit for surface water discharge.	3.6	3.40	3.25-3.83
3W: Flocculation Sedimentation, Filtration Air Stripping Carbon Adsorption Discharge to Surface Water	Cleanup goals for PAHs and benzene should be met. As with Alternative 2W, final CCA removal efficiencies must be demonstrated through testing. Recovery of the full ground water plume will require offsite access/ easement.	Sludge generation, elimination of existing aquatic biota (if present), and air emissions containing volatile organic contaminants.	Reduced public health risk associ-ated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, and en-dangered species. Greater degree of risk reduction (than 2W) achieved by VOC treatment.	NPDES permit for surface water discharge.	3.6	3.42	3.22-3.86

TABLE 14
(continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost (Millions $): Total Present Worth	Cost (Millions $): Range Based Sensitivity Analysis
4W: Surface Water Precipitation Flocculation, Sedimentation, Filtration Ground Water Filtration Air Stripping Carbon Adsorption Discharge to Surface Water	All cleanup goals and ARARs should be met. Recovery of the full ground water plume will require offsite access/easements.	Sludge generation and elimination of existing aquatic biota (if present), during surface water remediation.	Greater degree of risk reduction than 2W or 3W because treatment dis-tinquishes between different contami-nants in groundwater and surface water respectively (organic vs. inorganic).	NPDES permit for surface water discharge.	3.8	3.65	3.57-4.14
5W: Flocculation, Sedimentation, Filtration Discharge to POTW	All cleanup goals should be met. The most cost-effective pre-treatment process should be determined by treatability testing. Recovery of the full ground water plume will require offsite access/easements. Piping to POTW will also require easements.	Sludge generation and elimination of existing aquatic biota (if present), during surface water remediation.	Greatest degree of risk reduction. Contaminated ground water and surface water are extracted. Effluent is direct to POTW rather than site surface water.	Local POTW must accept site wastewaters.	3.6	3.14	2.84-3.51

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost ($): Total Present Worth	Cost ($): Range Based on Sensitivity Analysis
1C: Offsite landfill (hazardous) of apparent CCA crystals	Eliminates the risk of onsite exposure.	Worker exposure during removal.	Reduce ingestion/ direct contact risk to wildlife and potential human exposure. Effective containment depends on integrity of the RCRA facility.	Hazardous waste manifest and transport by a licensed hauler to permitted RCRA facility.	0.1	9,600	N/A
1A: Offsite landfill (nonhazardous) of assumed asbestos insulation	Eliminates the risk of onsite exposure.	Worker exposure during removal.	Reduce ingestion/ direct contact risk to wildlife and potential human exposure. Effective containment depends on integrity of the RCRA facility.	Manifest and transport by licensed hauler to permitted RCRA facility.	0.1	13,500	N/A
1SS: Onsite disposal of solidified sludge	Direct contact risk reduced in association with a cap. Solidification should limit mobility but the matrix may loose integrity over time.	Worker exposure during removal.	Reduced direct contact risk to wildlife and human exposure.	Future land use restrictions possible.	0.1	27,700	N/A
2SS: Offsite disposal of solidified sludge	Eliminates the risk of onsite exposure.	Worker exposure during removal.	Reduced direct contact risk to wildlife and human exposure. Effective containment depends on integrity of the RCRA facility.	Hazardous waste manifest. Transport by licensed hauler to permitted RCRA facility.	0.1	28,900	N/A

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost ($): Total Present Worth	Cost ($): Range Based on Sensitivity Analysis
1L: Onsite treatment of CCA solution and/or wastewater with discharge to surface water	Expected to meet ARARs. High contaminant concen-trations will pose special con-siderations to meet NPDES to POTW requirements.	Sludge generation during treatment.	Reduced spill potential and contaminant migration.	NPDES permit or acceptance by POTW.	0.1	104,000	N/A
2L: Offsite transport and treatment of CCA solution and/or wastewater	Eliminates the risk of onsite exposure.	Accident risk due to offsite shipment (12 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration. Effective contain-ment depends on integrity of the RCRA facility.	Hazardous waste manifest. Transport by licensed hauler to permitted RCRA facility.	0.1	126,100	N/A
3L: Offsite transport of CCA solution.	Recycles CCA solution. CCA contaminated waste-water would be treated on or offsite (Alternatives 1L or 2L).	Accident risk due to offsite shipment (10 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration onsite.	Liability waiver under CERCLA must be granted. Effective spill prevention, control, and countermeasures would be required at the relocation facility.	0.1	25,500	N/A
1T/P: Removal and cleaning of tanks and piping Recycle as strap (sell)	Eliminates waste disposal concerns.	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.	EPA certification that tanks are nonhazardous.	0.1	(112,400)	N/A
2T/P: Removal and cleaning of tanks and piping Disposal of offsite in a nonhazardous landfill	Removes old tanks and piping from the site.	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.	Manifest and transport by a licensed hauler to permitted RCRA facility preferred.	0.1	87,900	N/A

TABLE 15

SUMMARY OF INSTITUTIONAL AND LAND USE RESTRICTIONS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	ACTIVITIES				
	FENCING[1]	DEED RESTRICTIONS	LAND USE	LAND DEVELOPMENT	GROUND WATER USE
SOIL AND SEDIMENT ALTERNATIVES					
1S: No Action	Yes	Yes	Yes	Yes	N/A
2S: Surface Cap	Yes	Yes	Yes	No	N/A
3S: Washing	Yes	No	No	No	N/A
4S: Thermal Processing and/or Solidification	Yes	No	No	No	N/A
GROUND WATER AND SURFACE WATER ALTERNATIVES					
1W: No Action	Yes	Yes	N/A	N/A	Yes
2W: Pretreat and GAC	Yes	No	N/A	N/A	No
3W: 2W and Airstripping	Yes	No	N/A	N/A	No
4W: Segregated SW and GW Treatment	Yes	No	N/A	N/A	No
5W: Pretreatment and Discharge to POTW	Yes	No	N/A	N/A	No

[1] Fencing restrictions apply to the period of remediation only (except for no action).

Yes = Restrictions Apply
No = No restrictions after remediation assuming that ARARs or cleanup goals are met.
N/A = Not Applicable

TABLE 16

SUMMARY OF THE PUBLIC HEALTH AND ENVIRONMENTAL EFFECTS EVALUATION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	SHORT-TERM REMEDIATION IMPACT	LONG-TERM RISK REDUCTION
SOIL AND SEDIMENT ALTERNATIVES		
1S: No Action	Not applicable	Not applicable
2S: Surface Cap	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) would be disturbed.	Decrease in contaminant mobility and reduction of direct contact risk.
3S: Washing	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) would be disturbed.	Decreases in contaminant mobility and volume, reduced direct contact risk, and reduced leaching to ground water/surface water.
4S: Thermal Processing and Solidification	Potential air omissions during thermal processing could contain toxic gases (metal oxides). Displacement of aquatic biota and endangered plant species (if present) during excavation/dredging.	Decreases contaminant M/T/V. Direct contact risk and contaminant leaching to surface and ground water should be greatly reduced.
GROUND WATER AND SURFACE WATER ALTERNATIVES		
1W: No Action	Not applicable	Not applicable
2W: Pretreat and GAC	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, an endangered species.
3W: 2W and Airstripping	Sludge generation, elimination of existing aquatic biota (if present), and air emissions containing volatile organic contaminants.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, an endangered species. Greater degree of risk reduction (than 2W) achieved by VOC treatment.
4W: Segregated SW and GW treatment	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Greater degree of risk reduction than 2W or 3W because treatment distinguishes between different contaminants in groundwater and surface water respectively (organic vs. inorganic)

TABLE 16

(continued)

REMEDIAL ALTERNATIVE	SHORT-TERM REMEDIATION IMPACT	LONG-TERM RISK REDUCTION
5W: Pretreat and POTW	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Greatest degree of risk reduction. Contaminated ground water and surface water are extracted. Effluent is direct to POTW rather than site surface water.
<u>HAZARDOUS MATERIALS, TANKS AND PIPING</u>		
1C and 1A: Offsite disposal of CCA Crystals and Asbestos Insulation	Workers exposure during removal.	Reduced ingestion/direct contact risk to wildlife and potential human exposure. Effective containment depends on integrity of the RCRA facility.
1SS: On site disposal of solidified sludge	Workers exposure during removal.	Reduced direct contact risk to wildlife and human exposure.
2SS: Offsite disposal of solidified sludge	Workers exposure during removal.	Reduced direct contact risk to wildlife and human exposure. Effective containment depends on integrity of the RCRA facility.
1L: Onsite Treatment of CCA Solution and wastewater	Sludge generation during treatment.	Reduced spill potential and contaminant migration.
2L: Offsite Disposal of CCA Solution and wastewater	Accident risk due to offsite shipment (12 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration. Effective containment depends on integrity of the RCRA facility.
3L: Offsite Transport of CCA Solution	Accident risk due to offsite shipment (10 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration onsite.
1T/P: Sell cleaned tanks/piping for scraps	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.
2T/P: Disposal of cleaned tanks and piping offsite	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.

TABLE 17

IMPLEMENTABILTY EVALUATION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	CONSTRAINTS TO IMPLEMENTATION	ESTIMATED TIME REQUIRED
SOIL AND SEDIMENT ALTERNATIVES		
1S: No Action	Not applicable	Not applicable
2S: Surface Cap	More extensive clearing and grubbing may be required outside the process area	9.3 months
3S: Washing	Implementation will depend on favorable results of treatability testing and use of non-toxic, non-hazardous surfactants.	1.5 years
4S: Thermal Processing and Solidification	Effectiveness must be demonstrated by treatability testing. The increased volume created by solidification mAy be objectionable.	1.5 years
GROUND WATER AND SURFACE WATER ALTERNATIVES		
1W: No Action	Not applicable	Not applicable
2W: Pretreat and GAC, 3W: 2W and Airstripping, and 4W: Segregated SW and GW	Recovery of the full extent of the estimated ground water plume will require offsite property easement/approval. Treatability testing would be required to demonstrate ultimate effectiveness.	3.6 - 3.8 years
5W: Pretreat and POTW	The recovery constraint for alternatives 2W-4W also applies. The POTW must accept the wastewater.	3.6 years
HAZARDOUS MATERIALS, TANKS AND PIPING		
1C and 1A: Offsite disposal of Cca Crystal Asbestos Insulation	None	1 month
1SS: Onsite disposal of solidified sludge	Selection of Alternative 2S or 4s for soils and sediments.	1 month
2SS: Offsite disposal of solidified sludge	None	1 month
1L: Onsite Treatment of CCA Solution and/or wastewater	Selection of Alternative 4W or 5W for surface water treatment.	1 month
2L: Offsite Disposal of CCA Solution and/or wastewater	A liability waiver under CERCLA is required.	1 month
3L: Offsite transport of CCA Solution		1 month
1T/P: Sell cleaned tanks/piping for scrap	Tanks must be EPA certified as non-hazardous.	1 month
2T/P: Disposal of cleaned tanks and piping offsite	None	1 month

TABLE 18

SUMMARY OF PRESENT WORTH COSTS
FOR HAZARDOUS MATERIALS, TANKS AND PIPING
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

		TOTAL PRESENT WORTH COST[1] $
1C:	Offsite landfill (hazardous) of apparent CCA crystals	$9,600
1A:	Offsite landfill (non-hazardous) of assumed asbestos insulation	$13,500
1SS:	Onsite disposal of solidified sludge	$27,700
2SS:	Offsite disposal of solidified sludge	$28,900
1L:	Onsite treatment of CCA solution and/or wastewater discharge to surface water	$104,000
2L:	Offsite transport and treatment of CCA solution and/or wastewater	$126,100
3L:	Offsite transport of CCA solution	$25,500
1T/P:	Removal and cleaning of tanks and piping Recycle as scrap (sell)	($112,400)
2T/P:	Removal and cleaning of tanks and piping Dispose of offsite in non-hazardous landfill	$87,900

(1) The total present worth is based on capital costs since remediation is one-time and does not involve O&M.

($) Indicates negative cost = cash flow payment.

TABLE 19

SUMMARY OF SENSITIVITY ANALYSIS FOR SOIL AND SEDIMENT ALTERNATIVES
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	Average Cost [1] ($1,000)	Minimum Cost ($1,000)	Maximum Cost ($1,000)
1S: No action	0	0	0
2S: Partial excavation/dredging of soils and sediments with surface capping	2,803	2,289	3,300
3S: Excavation/dredging with soil and sediment washing	10,995	4,300	20,009
4S: Excavation/dredging of soils/sediments with thermal processing and/or solidification	14,029	5,671	26,143

[1] The same as total present worth costs from Table 5-1.

TABLE 20

SUMMARY OF SENSITIVITY ANALYSIS FOR GROUND WATER AND SURFACE WATER ALTERNATIVE
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	Average Cost [1] ($1,000)	Minimum Cost ($1,000)	Maximum Cost ($1,000)
1W: No action Long-Term Monitoring	592	592	592
2W: Flocculation, Sedimentation, Filtration Carbon Adsorption Discharge to Surface Water	3,398	3,248	3,826
3W: Flocculation, Sedimentation, Filtration Air Stripping Carbon Adsorption Discharge to Surface Water	3,426	3,225	3,861
4W: Surface Water Precipitation Flocculation, Sedimentation, Filtration Ground Water Filtration Air Stripping Carbon Adsorption Discharge to Surface Water	3,656	3,571	4,140
5W: Flocculation, Sedimentation, Filtration* Discharge to POTW	3,140	2,842	3,522

[1] The same as total present worth costs from Table 5-2.

* Minimum = filtration
Average = flocculation, sedimentation, filtration
Maximum = precipitation, flocculation, sedimentation, filtration

5.1.6 IMPLEMENTABILTY

Table 17 presents a summary of the evaluation performed on the constraints to implementation.

5.1.7 COST

Summaries of present worth costs including the minimum and maximum costs generated by a sensitivity analysis for these alternatives is given in Tables 18 through 20. The uncertainty considered in the sensitivity analysis was the volume. Volume for each contaminated environmental medium. No sensitivity analysis was conducted for the hazardous materials, tanks and piping alternatives.

5.1.8 STATE ACCEPTANCE

The State of North Carolina supports the alternative stated in the Declaration and section 6.0. The State of Carolina recognizes the 10% cost share and operation and maintenance responsibilities associated with this alternative.

5.1.9 COMMUNITY ACCEPTANCE

The Agency conducted a Public Meeting on February 21, 1989 at the Seventy-First Senior High School Auditorium in Fayetteville, North Carolina. The Agency discussed the findings of the RI, reviewed the evaluation of remedial technologies and remedial action alternatives as presented in the Draft Final Feasibility Study dated December 16, 1988 and presented the Agency's preferred remedial action alternative. The meeting initiated a three week comment period. Besides the questions addressed at the public meeting, no additional comments/questions/concerns were received by the Agency.

Community acceptance is assessed in the attached Responsiveness Summary. The Responsiveness Summary provides a thorough review of the public comments received on the RI, FS, Proposed Plan, and U.S. EPA's responses to the comments received.

6.0 RECOMMENDED ALTERNATIVE

6.1 DESCRIPTION OF RECOMMENDED REMEDY

Description of Selected Remedy

Prior to initiating any remedial action on-site, a site survey will be conducted to determine the presence of any endangered plant species exist on-site.

REMEDIATION OF HAZARDOUS MATERIALS, TANKS & PIPING

Off-site disposal of sodium dicromate - copper sulfate - arsenic pentoxide (CCA) salt crystals, the solidified creosote and asbestos-containing pipe insulation. The CCA crystals and solidified creosote will be disposed of at a RCRA permitted landfill. The asbestos-containing pipe insulation will be disposed of at the Cumberland County Solid Waste Facility pursuant to the facilities specifications.

The tanks and associated piping, above and below ground, will be emptied, flushed and cleaned, including triple rinsing, to render the metal non-hazardous. The metal will then be cut and either sold to a local scrap metal dealer or disposed of at the Cumberland County Solid Waste Facility. For those tanks and/or piping that cannot be cleaned sufficiently to render them non-hazardous will be transported to a RCRA permitted landfill for disposal.

The contents of the tanks and associated piping contains approximately 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater. A buyer of the 50,000 gallons of 3 percent CCA solution will first be pursued. If no buyer can be found, then the 50,000 gallons of 3 percent CCA solution along with the 15,000 gallons of CCA contaminated wastewater as well as wastewater generated on-site will be treated on-site through the water treatment system set up for treating the pumped surface waters and extracted groundwater.

SOURCE CONTROL (Remediation of Contaminated Soils)

The preferred alternative for the remediation of contaminated soils/sediment is a soil washing/flushing technique. The alternate source control alternative is a low temperature process to remove the organics contaminants followed by either a soil washing/flushing technique or soil fixation/solidification/stabilization process to address the inorganics. The decision as to which source control alternative will be implemented will be based on data generated by the soil washing/flushing treatability study to be conducted during the remedial design.

Contaminated soils/sediment will be excavated, treated and placed back in the excavation. All wastewater generated will either be reused or treated on-site. Following completion of on-site remedial activities, those areas disturbed will be revegetated

MIGRATION CONTROL (Remediation of Contaminated Groundwater)

Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Recovery will be conducted in 10,000 square foot subareas at a time, and the well points will be moved to adjacent areas for subsequential dewatering.

Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.

A water treatment system will be established on-site. The system's influent will include contents of the tanks and piping, all wastewater generated due to remedial action implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a surface stream. The range of treatment for the contaminated water includes biological degradation, air stripping, filtration through activated carbon filter, and metal removal through flocculation, sedimentation and precipitation. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluents, including both discharged water and/or air, will meet all ARAR's.

This recommended alternatives meet the requirements of the NCP, 40 CFR Section 300.68(j) and SARA. This recommended remedy permanently and significantly reduces the volume of hazardous substances in the groundwater, reduces the toxicity and/or mobility of contaminants in the soils.

6.2 OPERATIONS AND MAINTENANCE

Long term operation and maintenance (O&M) will concentrate on the groundwater extraction, water treatment and groundwater monitoring systems.

6.3 COST OF RECOMMENDED ALTERNATIVE

The estimated present worth cost for containerizing and transporting the CCA crystals and solidified creosote to Pinewood, SC, is $42,400. The estimated cost for disposing of the asbestos-containing piping insulation at the local county landfill is $100. The present worth cost for cleaning and disposing of the tanks and piping is $87,900 if a metal dealer is found to purchase the scrap metal or $112,400 if the Agency needs to dispose of the scrap metal at Pinewood, SC. There are no O&M costs associated with the above activities.

The treatment of the liquids held in the tanks, 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater, has a present worth cost of approximately $104,000. The O&M costs have been factored into the O&M costs of operating and maintaining the water treatment system.

The estimated present worth cost for the soil washing/flushing alternative for contaminated soils and sediments is $11.00 million. This includes capital and O&M costs for the 1.5 year treatment period. The estimated present worth cost for the low temperature destruction process combined with either soil washing/flushing or a soil fixation/solidification/stabilization process for contaminated soils and sediments is $14.03 million. This includes capital and O&M costs for the treatment period.

The estimated present worth cost for pumping surface water and extracting groundwater and treating the commingled waters ranges from $3.4 to $3.65 million, depending on the extent of treatment and ultimate discharge point for the treated water. The capital costs and present worth O&M costs over 30 years range from $2.11 to $2.34 million and $1.02 to $1.31 million, respectively

The present worth cost of the preferred remedy, including all activities, ranges from $14.37 million to $14.91 million.

6.4 SCHEDULE

The planned schedule for remedial activities at the Cape Fear Site is as follows:

June 1989	--	Approve Record of Decision
July 1989	--	Initiate Remedial Design/Treatability Study
October 1989	--	Superfund/State Contract Signed
November 1989	--	Complete Treatability Studies
December 1989	--	Initiate Remedial Action for Addressing Contaminated Groundwater and Other Specific Cleanup Activities
April 1990	--	Complete Remedial Design for Source Control and Mobilize

6.5 FUTURE ACTIONS

The only anticipated future action expected to follow completion of the remedial action is periodic monitoring of groundwater to insure remediated levels obtained during the remediation is maintained.

6.6 CONSISTENT WITH OTHER ENVIRONMENTAL LAWS

A remedial action performed under CERCLA must comply with all applicable Federal, State and local regulations. All alternatives considered for the Cape Fear Site were evaluated on the basis of the degree to which they complied with these regulation. The recommended alternatives were found to meet or exceed all applicable environmental laws, as discussed below:

TABLE 21

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law, Regulation, Policy and Standard	Application
Resource Conservation and Recovery Act (RCRA)	
40 CFR 261: Definition and identification	Definition and identification of waste matrial as hazardous
40 CFR 262: Standards for generators of hazardous waste	Generator requirements include identification of waste generation activity, obtaining EPA ID number, record keeping, and use of uniform national manifest
40 CFR 263: Standards for treatment of hazardous waste	The transportation of hazardous waste is subject to requirements including DOT regulations, manifesting, record keeping, and discharge cleanup
40 CFR 264: Standards for treatment of hazardous waste	Incineration requirements
40 CFR 264: Standards for Disposal of hazardous waste	Closure requirements Class C closure - landfill closure meeting minimum technology requirements for hazardous materials Class D closure - landfill closure meeting minimum technology requirements for non-hazardous material
40 CFR 268: Land disposal restriction	Excavated waste disposed onsite may be subject to land disposal restriction if placement occurs
40 CFR 257: Standards for Disposal of hazardous waste	Closure requirements
40 CFR 264, Subpat I: Containers	Storage requirement for containers

TABLE 21
(continued)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law, Regulation, Policy and Standard	Application
Clean Water Act (CWA)	
40 CFR 122, 125: National Pollutant Discharge Elimination Systems (NPDES)	Discharges of extracted/treated groundwater will be subject to substantive requirements of the NPDES process if discharged to a local stream. NPDES is administrative by the state
40 CFR 403: Effluent Guidelines and Standards: Pretreatment Standards	Discharges of extracted/treated groundwater will be subject to pretreatment requirement if discharged tot he POTW
40 CFR 230: Dredge and Fill Requirements	Actions in a wetland or floodplain
Ambient Water Quality Criteria	AWQC may be used for discharge requirement where there are no state water quality standards
CAA section 109 and 40 CFR 50: National Ambient Air Quality Standards	Preconstruction review of incineration NAAQS for PMIO applied to fugitive dust
Occupational Safety and Health Act	
29 CFR 1910: General standards for work protection	Worker safety for construction and operation of remedial action
29 CFR 1090: Regulations for workers involved in hazardous waste operations	Workers safety for construction and operation of remedial action
Hazardous Materials Transportation Act	
49 CFR 100 through 199: Transportation of hazardous material	The transport of hazardous waste is subject to DOT requirements

TABLE 21
(continued)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law, Regulation, Policy and Standard	Application
Intergovernmental Review of Federal Programs	
Executive order 12372	
40 CFR 29	State and local coordination and review of proposed EPA assisted projects
Fish and Wildlife Coordination Act	Protection of fish and wildlife when federal actions result in the control or modification of a natural stream or body of water
Endangered Species Act	
Section 7(c)	consultation with the fish and wildlife service if action may impact endangered species or critical habitat
Executive Orders for Flood Plains (EO 11988)	
40 CFR Part 6, Subpart A	Protection of flood plains affected by remedial action
Executive Orders for Wetlands (EO 11990)	Protection of wetlands affected by remedial action
Safe Drinking Water Act	Maximum Contaminant Levels (MCLs) established under the Sate Drinking Water Act were found to be relevant and appropriate to remedial action at the Cape Fear Site. The cleanup goals for groundwater were established in Section 4.
North Carolina Requirements	
State Drinking Water Standards	Maximum contaminant levels established by the State of North Carolina regulations; are adopted from those of the Federal Safe Drinking Water Act, and will be met.

7.0 COMMUNITY RELATIONS

Fact sheets were transmitted to interested parties, residents, media and local, state and federal officials during the RI/FS process. The Agency also conducted the FS public meeting.

The Information Repository/Administrative Record was established at Cumberland County Public Library & Information Center located at 300 Maiden Lane, Fayetteville, North Carolina 28301.

A public meeting was held on February 21, 1989, at the Seventy-First Senior High School in Fayetteville, North Carolina. At this meeting, the remedial alternatives developed in the FS were reviewed and discussed and EPA's preferred remedial alternative was disseminated. The groundwater migration alternative was presented as described in Section 6.1 Description of Recommended Alternative. Two source remediation alternatives were presented. EPA's preferred source remediation alternative for is a soil washing process. The Agency's back-up alternative in the event that a effective soil washing process cannot be devised is an on-site low temperature process to mitigate the organics followed by either soil washing or a soil fixation/solidification/stabilization process to address the metals. Both alternatives are permanent remediations but the soil washing alternative is estimated to be 3 million dollars less than the low temperature process.

The public comment period concluded on March 14, 1989. The only comments received during the public comment period were those aired and responded to at the public meeting. The Responsiveness Summary summarizes the comments stated in the public meeting.

8.0 STATE INVOLVEMENT

The State involvement has been maintained throughout the RI/FS process with reviewing pertinent documents such as the draft Remedial Investigation Report, the draft Feasibility Study, the draft Record of Decision and have been carbon copied all relevant correspondences.

The State of North Carolina supports the alternative stated in the Declaration and Section 6.0. The State of North Carolina recognizes the 10% cost share under CERCLA, Section 104(c) and operation and maintenance responsibilities associated with this alternative.

APPENDIX B

RESPONSIVENESS SUMMARY
FOR THE
AMENDMENT TO THE RECORD OF DECISION
AT THE
CAPE FEAR WOOD PRESERVING SUPERFUND SITE
FAYETTEVILLE, CUMBERLAND COUNTY
NORTH CAROLINA

Public Comment Period:
November 14, 2000 through December 14, 2000

RESPONSIVENESS SUMMARY
FOR THE
AMENDMENT TO THE RECORD OF DECISION
AT THE
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FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA

Public Comment Period:
November 14, 2000 through December 14, 2000

Prepared by:
U.S. Environmental Protection Agency, Region 4
February 8, 2001

CAPE FEAR WOOD PRESERVING SUPERFUND SITE

RESPONSIVENESS SUMMARY
FOR THE
AMENDMENT TO THE RECORD OF DECISION

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ATTACHMENTS:

Attachment A -- Transcript from November 14, 2000 Public Meeting

RESPONSIVENESS SUMMARY
FOR THE
CAPE FEAR WOOD PRESERVING SUPERFUND SITE

Based on Public Comment Period
Which Includes November 14, 2000 Public Meeting
Held At The Cliffdale Branch Library
In Fayetteville, Cumberland County, North Carolina

This community relations responsiveness Summary is divided into the following sections:

Section 1.0 -- This section discusses EPA's revised alternative for remediating groundwater at the Site.

Section 2.0 -- This section provides a brief history of community interest and community relation activities conducted by the Agency.

Section 3.0 -- This section provides a summary of issues/concerns and questions/comments voiced by the local community and responded to by EPA during the November 14, 2000 Record of Decision Amendment public meeting. "Local community" may include local homeowners, businesses, the municipality, and not infrequently, potentially responsible parties. No written comments were received during the public comment period.

1.0 OVERVIEW

During the soil clean-up phase of the Site remediation, the Agency directed its contractor to install an 80 foot long french drain at the bottom of the excavation in the middle of the Site. The excavation was approximately 25 feet in depth. This was done because the existing groundwater remedial design (RD) incorporated 90 recovery wells in two (2) concentric rings. Based on experience gained at other Superfund sites, the potential cost for operating and maintaining 90 recovery wells over an estimated 30 years would be excessive. Therefore, it was envisioned that by installing the french drain a substantial number of recovery wells could be eliminated from the existing groundwater remediation design. In order to ascertain how many recovery wells could be eliminated, the Agency decided to re-evaluate the existing groundwater RD. This decision lead to the field work conducted in the Spring of 2000 and the consequential reassessment of the groundwater RD.

Based on results of this reassessment, the Agency revised the groundwater RD. EPA announced its intention to amend the June 30, 1989 Record of Decision (ROD) for the Cape Fear Wood Preserving Site, located in Fayetteville, North Carolina, in the Proposed Plan Fact Sheet mailed to the public on November 8, 2000. This fact sheet informed the public of the proposed changes to the ROD, the rationale for these changes, a comparison of the revised groundwater remedy to the original groundwater remedy, the starting and ending dates of the public comment period, and the date of the ROD Amendment public meeting.

The public was informed through the ROD Amendment Propose Plan Fact Sheet and display ad published in the Fayetteville Observer Times of the November 14, 2000 public meeting. The ROD Amendment Fact Sheet was mailed on November 8, 2000, and the ad was printed on November 7, 2000. The goals of the ROD Amendment public meeting were to review the work conducted as part of the effort to re-evaluate and revise the groundwater RD, identify the Agency's revised alternative, present the Agency's rationale for changing the alternative, encourage the public to voice its opinion with respect to the proposed changes, and inform the public that the public comment period on the proposed ROD Amendment would run from November 14, 2000 to December 14, 2000. The public was told that the public comment period could be extended 30-days, if requested. The public was also informed that all comments received during the public comment period would be incorporated into the Administrative Record/Information Repository and addressed in the Responsiveness Summary section of the ROD Amendment. The Responsiveness Summary would also summarize the comments/concerns voiced during the November 14, 2000 public meeting.

The information generated during the reassessment of the groundwater RD has not altered the Agency's opinion with regard to the risk posed by the groundwater beneath the Site. Under current conditions, the groundwater does not pose an unacceptable risk, however, the contaminants and the level of contamination in the groundwater does pose an unacceptable future risk if the water was to be used for potable purposes.

2.0 BACKGROUND

Interviews conducted in preparation for conducting the Remedial Investigation/Feasibility Study (RI/FS) in 1987 revealed that most residents on Reilly Road and on School Street have lived in the area for many years. Due to the transient nature of military life, the majority of residents in the Southgate subdivision are renters who are not in the area long enough to establish strong community ties. The community's interest has fluctuated in intensity since the discovery of contaminants in a residential well across from the Site in 1977. Community concerns have rarely been expressed to government officials; rather, information and fears have been shared and discussed amongst the area residents. To date, no organized community involvement has occurred with regard to the Cape Fear site.

During the RI/FS phase (1988 through 1989), some of the specific fears expressed by local residents and local officials centered on the following central themes:

1. Extent and Nature of the Contamination

Area residents possessed various amounts and types of information about the extent of contamination form the Cape Fear site, some of it stemming from misinformation and some from speculation. Residents did not have a thorough understanding of the contamination at the Site and whether or not the Agency had a full understanding of the extent of the problem.

2. Drinking Water Quality

Several residents expressed concern with regard to the quality of their drinking water and the potential adverse health effects from the consumption of contaminated water.

3. Health and Safety

Several of the residents questioned the health and safety implications posed by the Site’s accessibility to children and young adults and suggested that the area be secured. The numerous acts of vandalism that have occurred at the Site suggests that the area may be a gathering spot for youths carrying out activities that went undetected.

4. Property Value and Quality of Life

Almost every resident interviewed mentioned reductions in their property value as an area of concern. Some local officials view the area surrounding the Site as holding a good deal of potential for residential development. They are concerned that the property will not be restored to accommodate such growth.

5. Other Area-Wide Environmental Issues

According to local officials, an effort to site a hazardous waste incinerator in the area attracted 4,000 people to the public meeting of the proposed incinerator permit. Organized opposition to North Carolina’s proposed membership in a low-level radioactive waste compact that would oblige the State to eventually host a disposal site.

The following provides details on the cumulative community relations efforts conducted by the Agency. A Community Relations Plan (CRP) covering community relation activities during the RI/FS was developed in 1997. As part of this initiative, Information Repositories were established at the Cumberland County Public Library & Information Center, located at 300 Maiden Lane, Fayetteville, North Carolina 28301 and in EPA’s, Region IV Information Center in Atlanta, Georgia. The CRP was updated in December 1989 for the RD/RA phase. The files in these Repositories are available for public review during normal working hours.

The primary vehicles of disseminating information to the public has been through fact sheets and public meetings. As stated before, there has been limited community interested in the Site.

Public participation in any of the EPA sponsored meetings has had fewer than 10 attendees. To date, the following public meetings have been held:

February 21, 1989 – the Proposed Plan Public Meeting;

May 14, 1998 -- RA Kick-Off Public Meeting; and

November 14, 2000 – Proposed Plan Public Meeting for Amending the Record of Decision.

Numerous fact sheets have been disseminated to the public over the years. They are listed below:

September 1987	Fact Sheet on the Remedial Investigation
December 1988	Fact Sheet on the Feasibility Study
February 1989	Fact Sheet Presenting the Proposed Plan
August 1990	Fact Sheet on the Remedial Design
September 1991	Fact Sheet Presenting the First Explanation of Significant Different (ESD #1)
September 1992	Fact Sheet Updating the Public With Regard to RD/RA Activities
September 1993	Fact Sheet Updating the Public on the Capacity Assurance Issue and Translating the Results of the Groundwater Samples Collected in May 1993
April 1995	Remedial Action Update #1 Fact Sheet
August 1995	Fact Sheet Presenting the Second Explanation of Significant Difference (ESD #2)
May 1996	Fact Sheet Presenting the Third Explanation of Significant Difference (ESD #3) & Update #2 on the Remedial Action
December 1996	Remedial Action Update #3 Fact Sheet
May 1998	Remedial Action Update #4 Fact Sheet
October 1999	Remedial Action Update #5 Fact Sheet
November 2000	Record of Decision Amendment Proposed Plan Fact Sheet

3.0 SUMMARY OF MAJOR ISSUES/CONCERNS/QUESTIONS/STATEMENTS VOICED DURING NOVEMBER 11, 2000 PROPOSED PLAN PUBLIC MEETING FOR AMENDING THE RECORD OF DECISION

This section summarizes the major issues and inquiries expressed during the ROD Amendment public meeting as no written or verbal comments were received during the 30-day public comment period. The major issues can be categorized as follows:

- Migration of contaminants in the groundwater.
- Lack of public turnout/participation.
- What's being discharged to the sewer system?
- Who is paying for the work?
- Is the groundwater extraction/treatment/discharge system adequate to accomplish the goals?
- How long will the groundwater extraction/treatment/discharge system operate before we will know if the system will capture the plume?
- Is the Agency confident that the groundwater extraction/treatment/discharge system will work?
- How long will the groundwater extraction/treatment/discharge system need to operate?
- Since part of the groundwater extraction/discharge system and air sparging system will be installed off-site, will these property owners be able to use this property?
- What about maintenance of these systems on these private properties?
- Is there any compensation for using property that private land owners are paying taxes on?
- How long will the system be needed after the performance standards are obtained?

The issues/concerns/questions/statements listed above are in the general order they were expressed during the November 14, 2000 ROD Amendment public meeting. Below is a summary of these issues/concerns/questions/statements as well as EPA's responses:

3 .1 Migration of Contaminants in the Groundwater

Question: Has the contaminants migrated beneath the Southgate subdivision?

Answer: No. As can be seen in the overhead used during the presentation, groundwater is typically migrating to the east and west with the majority of the contamination remaining on Site. These is a line of monitoring wells (sentry wells) between the Site and the Southgate subdivision and no contamination has been detected in these wells.

3.2 Lack of Public Turnout/Participation

Statement: Disappointed there wasn't more publicity about the meeting as well as public participation in the meeting.

Response: Due to a restriction in finding because of the budget, only one ad was placed in the local newspaper, typically, more than one ad is published. The Agency distributed the Proposed Plan Fact Sheet, which included a notice of the meeting, on November 8, 2000.

3.3 What's Being Discharged to the Sewer System?

Question: What is the lift station for?

Answer: Only treated groundwater, when necessary, will be discharged through the lift station to the sewer system. The groundwater will be treated to meet the discharge parameters established by the sewer system. The lift system pumps the water from the Site through an underground pipe to the discharge point located on the other side of Cliffdale Road.

3.4 Who is Paying for the Work?

Question: Who is paying for all of this work?

Answer: The Federal government. One of the citizens stated, in other words, we all are.

3.5 Will the Groundwater Extraction/Treatment/Discharge System Accomplish the Goals?

Question: How comfortable is the Agency with everything?

Answer: The Agency is confident that the proposed system will keep the contaminants from migrating any further and that the proposed technologies will remediate the Site.

3.6 How Long Will the Groundwater Extraction/Treatment/Discharge System Operate Before we Will Know if the System Will Capture the Plume?

Question: When will the Agency know if any major modifications to the proposed remedy will be needed?

Answer: The Agency estimates that it will take a minium of six (6) months of operation before we will know the full extent of influence the groundwater extraction system will have on the aquifer. Once this threshold is reached, the Agency will know whether or not any initial modifications to the system will be necessary.

3.7 Is the Agency Confident That the Groundwater Extraction/Treatment/Discharge System will Work?

Question: Will the proposed system work?

Answer: Yes.

3.8 How Long will the Groundwater Extraction/Treatment/Discharge System Need to Operate?

Question: How long it take to achieve the groundwater performance standards?

Answer: Based on the computer model, the Agency's contractor has estimated that it will take 5-6 years to remediate the groundwater. To be conservative, the Agency is saying 8 years. However, all of this can be wrong, its only a best guess.

3.9 Since Part of the Groundwater Extraction/Discharge System and Air Sparging System will be Installed Off-site, Will These Property Owners be Able to Use This Property?

Question: Can we drive over the areas where piping/tubing is buried?

Answer: Yes. The piping/tubing will be buried 2½ feet below ground, therefore, you should be able to drive over them, even a tractor. No electricity will be ran to the wells, compressed air will be used to operate the pumps.

3.10 What About Maintenance of These Systems on These Private Properties?

Question: What happens if something goes wrong with the air line somewhere between point "A" and point "B"? How are you going to determine where the problem is?

Answer: The Agency does not anticipate such a problem. The air line will made of very heavy, semi-flexible plastic for this purpose. However, if a problem does develop, we should be able to isolate the problem between two (2) vaults and then dig up and repair the bad spot or replace the entire length of piping/tubing between the two vaults.

3.11 Using Property that Private Land Owners are Paying Taxes On

Statement: Paying taxes on something a land owner cannot utilize.

Response: There is a mechanism for obtaining easements to property that allows the Agency to compensate the land owner. The Agency is pursuing this avenue.

3.12 How Long Will the System be Needed After the Performance Standards are Obtained?

Question: After the groundwater performance standards are obtained, what duration of period will be necessary before the system is turned off and removed?

Answer: The system will be removed when the Agency can confirm that the groundwater performance standards have been achieved. However, a specific time-frame to verify that the performance standards have been obtained could not be given to the public.

The last item discussed at the meeting was the notion of moving the Information Repository from the Cumberland County Public Library & Information Center located at 300 Maiden Lane in Fayetteville to the Cliffdale Branch Library located on Cliffdale Road. The Agency checked with the manager of the Cliffdale Branch, this library has no room to house the Information Repository. Therefore, the Information Repository will remain at its present location.

APPENDIX C

CONCURRENCE LETTER FROM THE STATE OF NORTH CAROLINA DEPARTMENT OF THE ENVIRONMENT AND NATURAL RESOURCES FOR THE CAPE FEAR WOOD PRESERVING SUPERFUND SITE FAYETTEVILLE, CUMBERLAND COUNTY NORTH CAROLINA

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

MICHAEL F. EASLEY, GOVERNOR
William G. Ross Jr., SECRETARY
WILLIAM L. MEYER, DIRECTOR

NCDENR

08 March 2001

Mr. Jon Bornholm
Superfund Branch, Waste Management Division
US EPA Region IV
61 Forsyth Street. SW
Atlanta, Georgia 30303

SUBJECT: Concurrence with Record Of Decision Amendment to Ground Water Remedial Action
Cape Fear Wood Preserving
Fayetteville, Cumberland County

Dear Mr. Bornholm:

The State of North Carolina has reviewed the Record of Decision (ROD) amendment received by mail on 12 February 2001 and with corrections by email on 16 February 2001 for the Cape Fear Wood Preserving Superfund site and concurs with the selected remedy, subject to the following conditions:

1. State concurrence on the ROD amendment for this site is based solely on the information contained in the amendment received by the State on 12 and 16 February 2001. Should the State receive new or additional information which significantly affects the conclusions or amended remedy contained in the ROD amendment, it may modify or withdraw this concurrence with written notice to EPA Region IV.

2. State concurrence on this ROD amendment in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the clean up of the site. The State reserves the right to review, overview comment, and make independent assessment of all future work relating to this site.

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3. If, after remediation is complete, the total residual risk level exceeds 10^{-6}, the State may require deed recordation/restriction to document the presence of residual contamination and possibly limit future use of the property as specified in NCGS 130A-310.8

4. State concurrence on the ROD amendment is conditional with a work plan being submitted within 60 days of receipt of this letter. The work plan shall consist of a ground water monitoring plan as discussed in section 3.0 of the ROD amendment. In addition, the Groundwater Section requires that any person who submits a request for monitored natural attenuation shall notify all property owners and occupants underlain by the contaminant plume of the nature and of the request for MNA. Notification shall be made by certified mail (please see Title 15A NCAC 2L .0114.) A list of property owners and occupants who need to be notified should be included in the work plan as well as a copy of the notification letter that will be sent to the property owners and occupants.

The State of North Carolina appreciates the opportunity to comment on the ROD amendment and looks forward to working with EPA on the final remedy for the subject site. If you have any questions or comments, please call me at 919 733-2801, extension 291.

Sincerely,

Grover Nicholson, Head
Remediation Branch
Superfund Section

cc: Phil Vorsatz, NC Remedial Section Chief
Jack Butler, Chief NC Superfund Section
Nile Testerman, NC Superfund